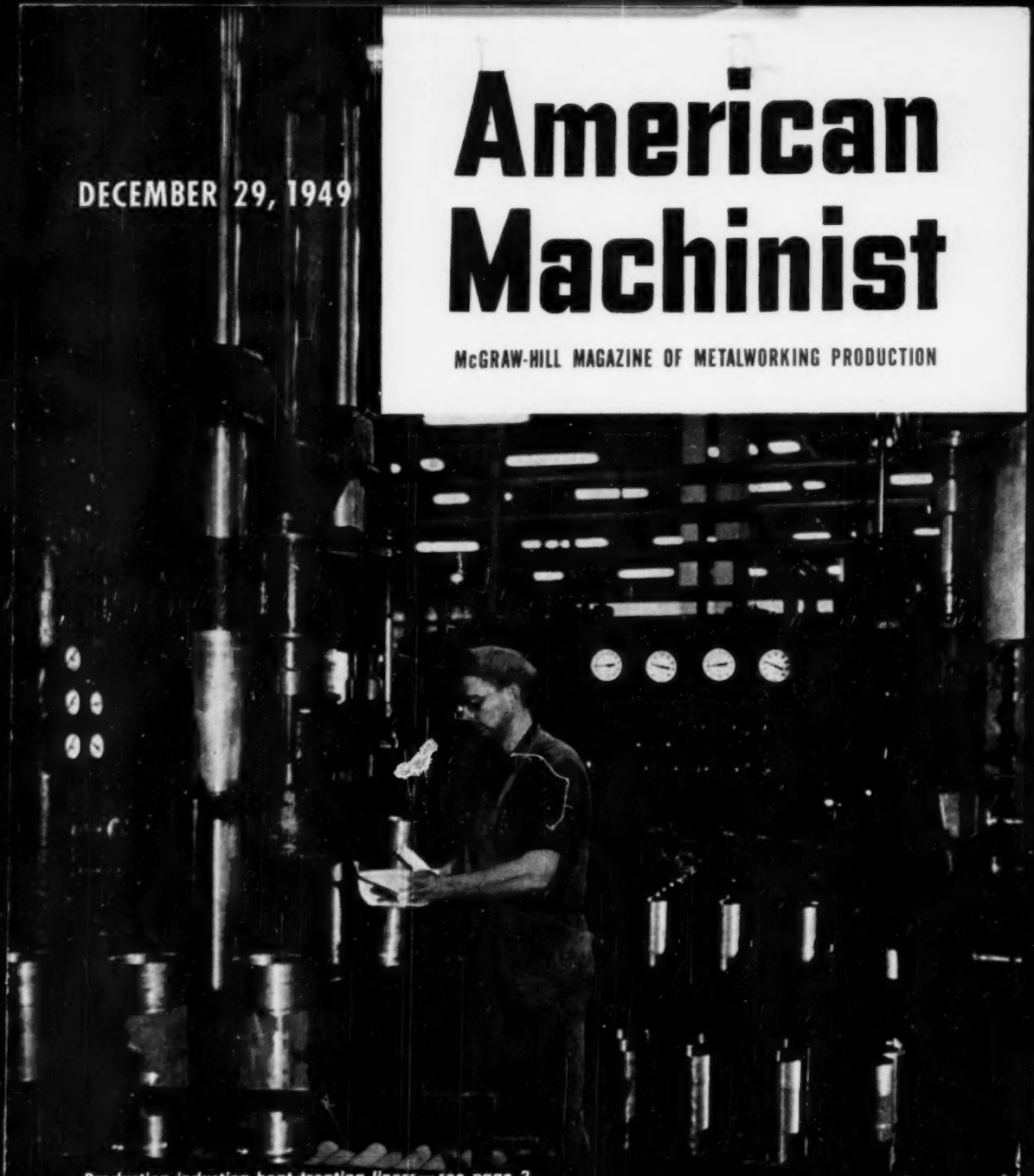
DECEMBER 29, 1949

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



Production induction heat-treating liners—see page 2

HOW TO DRESS GRINDING WHEELS

MECHANICAL HANDLING EASES DIESEL MAKING

Production of Overdrive Ball Rings
INCREASED FROM 1200 TO 2000 PIECES PER SHIFT
COMPLETELY AUTOMATIC CYCLE SPEEDS OUTPUT 50%
CHANGE-OVER TIME
CUT 50%
Con rods produced faster on New Heald Model 122 Bore-Matic
PRODUCTION OF ESCALATOR PARTS ...UP 100%
This ONE Heald Bore-Matic now does the work of four older machines
Valve Bodies Finished
THREE TIMES FASTER
on a New Heald Machine
Production increased from 60 to:
100 PARTS PER HOUR!
DOUBLE-END BORIZING GIVES THREE-WAY ADVANTAGE to Automotive Manufacturer
Still another automotive manufacturer
FINDS NEW WAYS TO CUT COSTS
by BORIZING
How Large Diesel Conn Rods are Finished
FIVE TIMES FASTER
on the Big New Heald Model 521 Bore-Matic
Compressor Blocks Now Finished
20% FASTER and with HIGHER PRECISION
on a new Heald Model 222 Bore-Matic
PRODUCTION OF TRANSMISSION CAMS SHIFTS INTO HIGH!
LAPPING TIME CUT 75%
PRECISION-GROUND
on the new Heald Model 261 Surface Grinder!

Savings like these can improve your production picture for 1950

Here are a few typical examples of what Heald engineering has done for others during the past year. Your precision finishing problems are different, of course. But chances are they offer the same opportunities for increasing production, improving product quality and cutting costs with new Heald machines.

Your nearest Heald representative will be glad to show you how to make the coming year a more profitable one.

HEALD

PRECISION INTERNAL AND SURFACE GRINDERS

PRECISION BORE-MATIC FINISHING MACHINES

THE HEALD MACHINE COMPANY

Worcester 6, Mass.

Branch Offices in Chicago • Cleveland • Dayton • Detroit
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American Machinist

MAGAZINE OF METALWORKING PRODUCTION

CONTENTS for DECEMBER 29, 1949

VOL. 93 NO. 26

Cover ..... *Operation pictured is described on page 2*

ADMINISTRATION

Editorial ..... *Burnham Finney* 53
Those Connecticut Yankees Again ..... *Paul E. Dillberg* 63
Rat's Nest ..... *Round Table* 70
Machines, Not Dollars, Assure Security ..... *J. A. Raterman* 109

SPECIAL REPORT

Dressing and Truing Grinding Wheels ..... *Miles J. Rowan* 71

ENGINEERING

Automatic Hard Facing Helps Quality, Cuts Costs ..... *Eldon C. Hurt* 87

ENGINEERING

Steels Marked with Code ..... *Alfred W. Gally* 92

FINISHING

Finishing Treatment for Magnesium (RBS) ..... *Jerome L. Bleiweis* 113

ASSEMBLY & INSPECTION

Welded Construction Cuts Broach Cost ..... *J. A. Smithers* 65
Multi-Dimension Checker Speeds Inspection ..... *Charles A. Lauer* 91
Double-Dial Fixture Gages Small Tapered Parts ..... *A. Vetsch* 93
Scale Notched to Gage Screws ..... *Roger Isetts* 94

MATERIALS HANDLING

Mechanized Handling Eases Engine Manufacture ..... *Lloyd J. Ely* 58
Extra Guides Feed Three Rolls of Flat Stock ..... *Mark N. Kert* 90
Motor Operates Stock Reel ..... *Bernard Levowich* 93

MATERIAL CUTTING, FORMING

Are We Slowpokes at Machining? ..... *E. J. Tangerman* 55
Form Cutter Mills Cavities in Die Blocks ..... *Fred H. Lingenfelder* 91
Air Cylinders Mechanize Old Manual Shear ..... *Lowell F. Stull* 91
Cam Dwell Ground with Cam on Bent Shaft ..... *Ray Cafiero* 92
Reset Turning Tool Backs Up Parting-Tool ..... *Dan J. Penway* 93
Harvester Uses Transfer Machines 98

TOOLING

Grinding Produces Progressive Shaving Die ..... *H. S. Hallewell* 66
Rolling Attachment Forms Threads Continuously ..... *N. Bonamini* 90
Standardized Clamp Blocks Simplify Many Setups ..... *Basil Clark* 90
Bench Cutter Snips Off Small Pins for Dies ..... *Elbert Jones* 92
Degreasing Hook for Disks Replaced by Spring ..... *Paul L. Newbury* 92
Ring Releases Backing Plate ..... *Ray Cafiero* 92
Safety Switch Cuts Off Press Feed ..... *Bernard Levowich* 93
Bored Tubing Grips Work in Inaccurate Chuck ..... *Roger Isetts* 94
Adapted Internal Micrometer Measures Tubing ..... *Paul Steiner* 94
Tubing Bender Made from Pulley ..... *Harry Nordstrom* 94
Gages for Screw Machine Parts (RBS) ..... *Herbert C. Lindberg* 115

NEWS OF METALWORKING

Spot News 49
Gaging Metalworking 50
Detroit News 106
Names in the News 107

DEPARTMENTS

Tips to Top Shop Men 57
Reference Book Sheets 113
Talking Shop 119
Equipment, Materials, Parts 120

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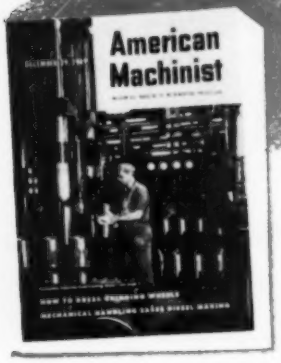


Chips and QUIPS

Our Cover . . . At the new Caterpillar diesel-engine plant in Peoria, Ill., major emphasis has been placed upon mechanization of handling. Our cover Kodachrome shows a typical operation, the internal induction hardening of finish-bored cylinder liners. The operator picks them from the conveyor sections in the background, places heat-treated liners on the conveyor in the foreground for transfer to draw furnaces. The hardening unit is a Budd machine.

A variety of the solutions to handling problems in this plant is shown in a picture-caption article in this issue.

Dressing . . . We attempt always to select basic subjects for our Special Reports, but seldom have we had one so basic as the current one, covering the dressing and truing of grinding wheels. Associate Editor Mike Rowan has been working on it for six months or more, with the assistance of a number of manufacturers of machines and wheels, plus experience data from users. It's a thoroughgoing job, scheduled initially for eight pages, but now taking twice that number. Reprints will, as usual, be available.

History . . . The Hartford Chapter, ASTE, has been compiling the first family tree of the lathe-chuck industry. It's really a series of trees—all seeded from one, the Fairman's. Such well-known chuck names as Cushman and Washburn are the results of the marriages of Simon Fairman's daughters; Horton was an employee; Westcott was the name given Fairman's second business; Skinner once worked for Horton—and so on. We bring you the story.

Welding . . . This issue brings two unusual welding articles, one on automatic hard facing, the other on arc welding of a 40-ton broaching-machine base. Eldon C. Hurt, welding engineer with Haynes Stellite, handles the first; J. A. Smithers, welding engineer of Lincoln Electric describes how Valley Welding & Boiler Co., Bay City, Mich., handled the second.

Slowpokes . . . At the Springfield, Vt., Machine Tool Show last June, we ended up in a too-hot hotel room 7 miles away form Chester, Vt. Other overheated denizens of this "summer" hotel were Bill Coomey, general supt. of Rice Barton Corp., and Howard Rich, jr., of Lynd-Farquhar in Boston. In the much-cooler bar, and in the wee hours of the morning, Mr. Coomey described some peculiar experiences with power requirements in high-speed planing. That set off a series of discussions and letters with men all over the country, based on the conviction that on many machining jobs we may be teetering on the near edge of a "valley of death" (as one man put it) beyond which tools apparently break down or power is insufficient. But there is a far rim to the valley—and in some cases an unexplored plateau. We tell what we can in our lead article.

Pen Pal . . . Quite frequently these days, we have a plea from a Japanese engineer who'd like to correspond with some American of similar interests. If you like to write letters send one to: Tashio Okumura, Nomura Machine Tool Works, 3 Shozaemoncho Sumiyoshiku, Osaka, Japan. He's 25 and was graduated from Osaka Imperial University last spring as an engineer.

Some years back, international correspondence was quite the thing. In our columns appeared many extracts from such letters, very informative.

Coming . . . Jan. 9 *A.M.* will show, in a Special Report, the development of Metalworking in this half-century, using *A.M.* for 1900 as a basis for comparison . . . Among articles are such subjects as lapping of gage blocks, rotary files and burrs, proper tool selection to cut machining costs, stock handling to automatize a punch press, tricky techniques in resistance welding, and new income for the small shop. Among departments will be Talented Tooling, Shop Shots and Practical Ideas.

Our Jan. 23 number will be our 37th Annual Review, redescribing 1500 or more items of shop equipment parts and materials and including our usual 16-page Statistical Abstract. Watch for it—and keep it to use.

STELLITEER . . . Eldon C. Hurt, after leaving Leland Stanford University in 1929, has been continuously with Haynes Stellite Company in Kokomo, Ind. For the first five years, he was a research engineer, then spent four years in the manufacturing department on Haystellite tungsten carbide materials. For the last eleven years, he has been working on research and development of automatic hard-facing machines and custom production of specialized machines to suit specific industrial problems. He summarizes his experience in this work in an article in this issue, showing the advantages of mechanizing or automatizing hard facing in order to cut costs. Mr. Hurt has written a number of earlier articles on hard facing.

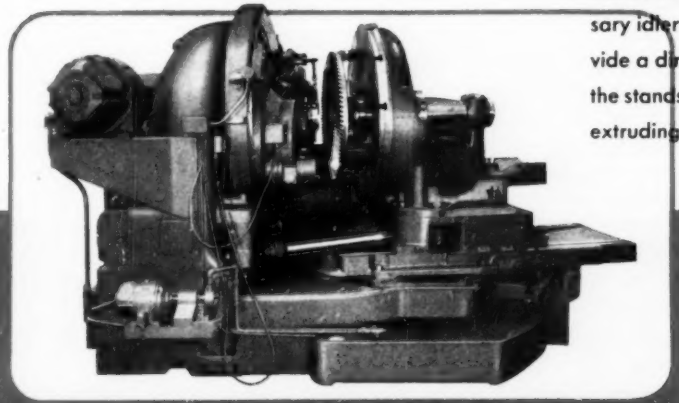
GLEASON BEVEL GEARS

CARRY HEAVY LOADS WITH COMPLETE RELIABILITY

IF YOUR POWER TRANSMISSION PROBLEM IS ONE OF
LOAD, SPEED OR ANGLE

Remember!—Bevel gears to transmit power and motion can be produced to satisfy *any* angular drive requirement without limitations as to load, speed or shaft angle.

Bevel gears have proven again and again their ability to handle the loads commonly found in heavy industry. For example, the 10" steel rod mill is a compact unit requiring a minimum of floor space. The right angle spiral bevels reduce the need for unnecessary idler gears in the gear train, provide a direct transmission of power to the stands and carry the heavy load of extruding with unfailing service.



Spiral bevel gears cut on the 14½" and 20" size gear set in the Gleason No. 60 Spiral Bevel and Hypoid Generator.

Let us assist you with your bevel gear design. The correct bevel gear, properly mounted, is your assurance of long-lasting trouble-free service.

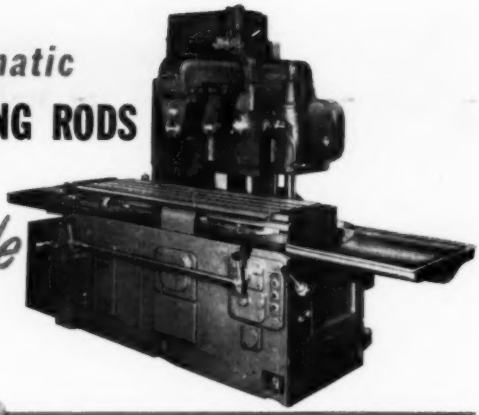
GLEASON *Works*
1000 University Avenue
Rochester 3, N. Y., U. S. A.

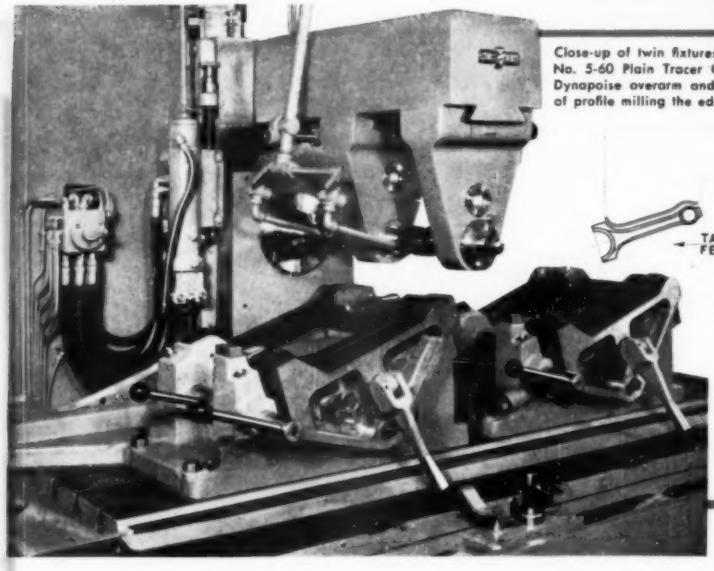
Builders of Bevel Gear Machinery for Over Eighty Years

Tracer Controlled Hydromatic

PROFILE MILLS TWO CONNECTING RODS AT ONE TIME

...Four Sides per Cycle





Close-up of twin fixtures mounted on the table of a CINCINNATI No. 5-60 Plain Tracer Controlled Hydromatic Milling Machine. Dynapoise overarm and other features facilitate the operation of profile milling the edges of two connecting rods at one time.

Drawing of work and automatic profile milling cycle. Solid color lines indicate tracer controlled feed; dotted lines indicate rapid traverse.

Part name	Connecting rod
Material	Steel forging
Operation	Profile mill edges of two rods
Cutters	Plain Helical, H.S.S.
Speed	60 feet per minute
Feed	4½" per minute
Production	11 rods per hour

Catalog M-1602 gives complete data and specifications. See Sweet's Catalog for brief details.

Five radii, four of them different, constitute the major dimensions of the sides of connecting rods for a well-known tractor engine. These radii, plus a straight section, must be milled in one continuous cut to obtain high production at a lower cost per piece. Cincinnati Application Engineers, expert in solving difficult milling problems, assigned the job to a CINCINNATI No. 5-60 Plain Tracer Controlled Hydromatic. As the table traverses, the spindle carrier, under control of the hydraulic tracer valve, is automatically raised or lowered to accurately duplicate the sheet steel master template of the desired contour. ¶ **To obtain maximum production and minimize nonproductive time, two fixtures are mounted on the table, each holding two parts. The entire cutting cycle is automatic, initiated with the start-stop lever. While two parts in one fixture are being milled, there's plenty of time to load the other fixture.** ¶ This cost cutting equipment is typical of the work of Cincinnati Application Engineers. Perhaps they can be of help in reducing costs in your shop. Write to Department E.S. enclosing blueprint and complete data.

CINCINNATI

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

Your Best Buy **for plain centertype work . . .**

CINCINNATI FILMATIC
Plain Hydraulic Grinders

You and your management have probably discussed many times the fact that your best buy for precision grinding operations is the machine that will give you the lowest cost per piece consistent with quality required, throughout a number of years. But how does one go about selecting the best buy? Here are some of the factors that will help you decide.

CINCINNATI FILMATIC 4" Plain Hydraulic Grinder

Rapid Grinding

Grinding is a chip removal process, and CINCINNATI FILMATIC Plain Hydraulics are ruggedly constructed and adequately powered for rapid grinding to close tolerances.

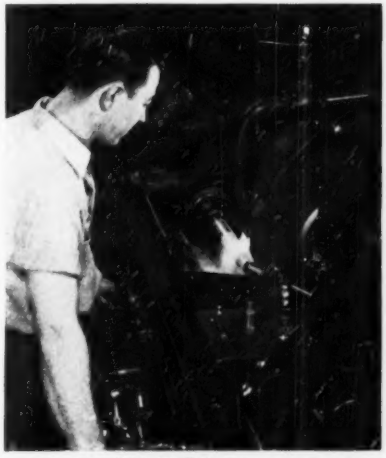
Minimum Operator Attention

FILMATIC Spindle Bearings—a feature of all CINCINNATI Plain Hydraulic Grinders—eliminate the major source of nonproductive operating time. They never require adjustment nor attention. No interference with production.

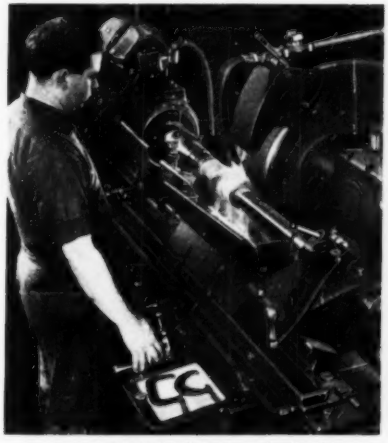
Long Life Without Maintenance

Several features reduce maintenance to the lowest figure: FILMATIC Spindle Bearings; protected ways with automatic filtered lubrication; built-in electrical controls.

Yes, these machines fulfill every requirement for low cost, high quality precision grinding. They are the best buy for your shop.



CINCINNATI FILMATIC 6" Plain Hydraulic Grinder



CINCINNATI FILMATIC 10" Plain Hydraulic Grinder

FILMATIC

Range of work handled is shown in table below. Additional information may be obtained by writing for desired catalogs. For brief specifications look in Sweet's Catalog.

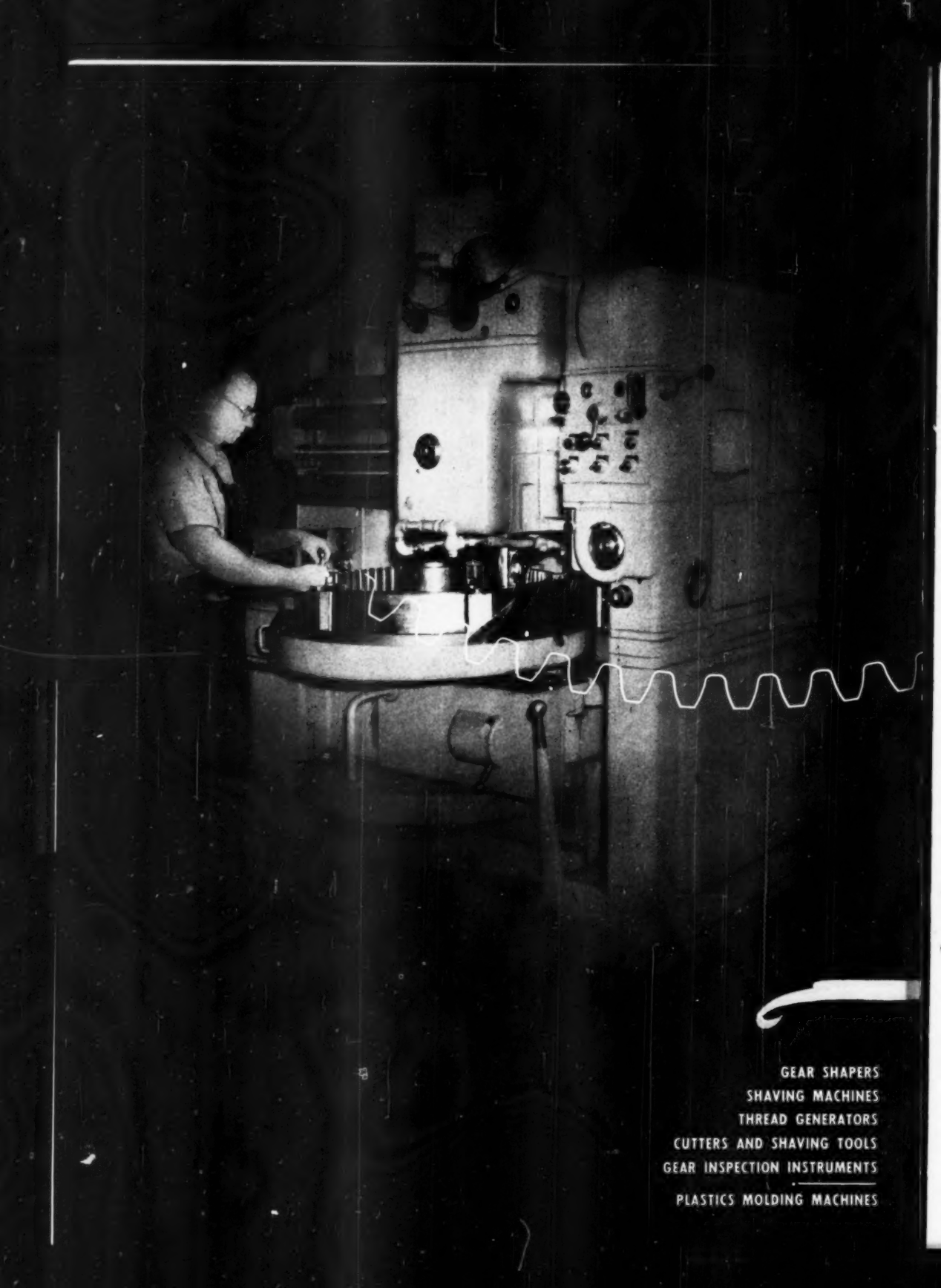
SWING	LENGTH BETWEEN CENTERS							CATALOG
4"	12"	18"						G-551-1
6"		18"	30"					G-556
10"-L		18"	30"					G-556
10"		18"		36"	48"	72"	96"	G-572
14"-L		18"		36"	48"	72"	96"	G-572

CINCINNATI GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CINCINNATI

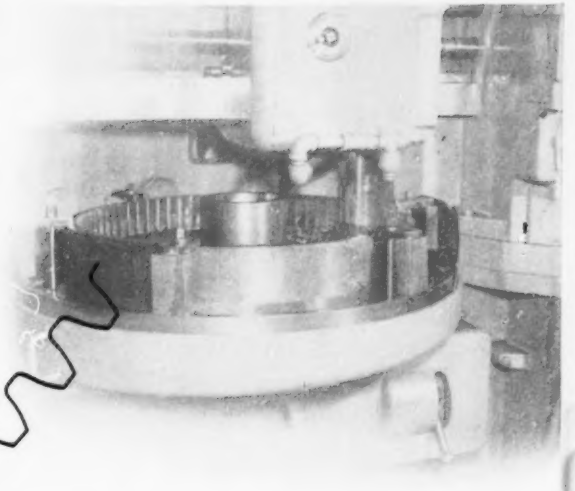
CENTER TYPE GRINDING MACHINES • CENTERLESS LAPPING MACHINES • CENTERLESS GRINDING MACHINES



GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

Record Time Rates on BIG GEARS

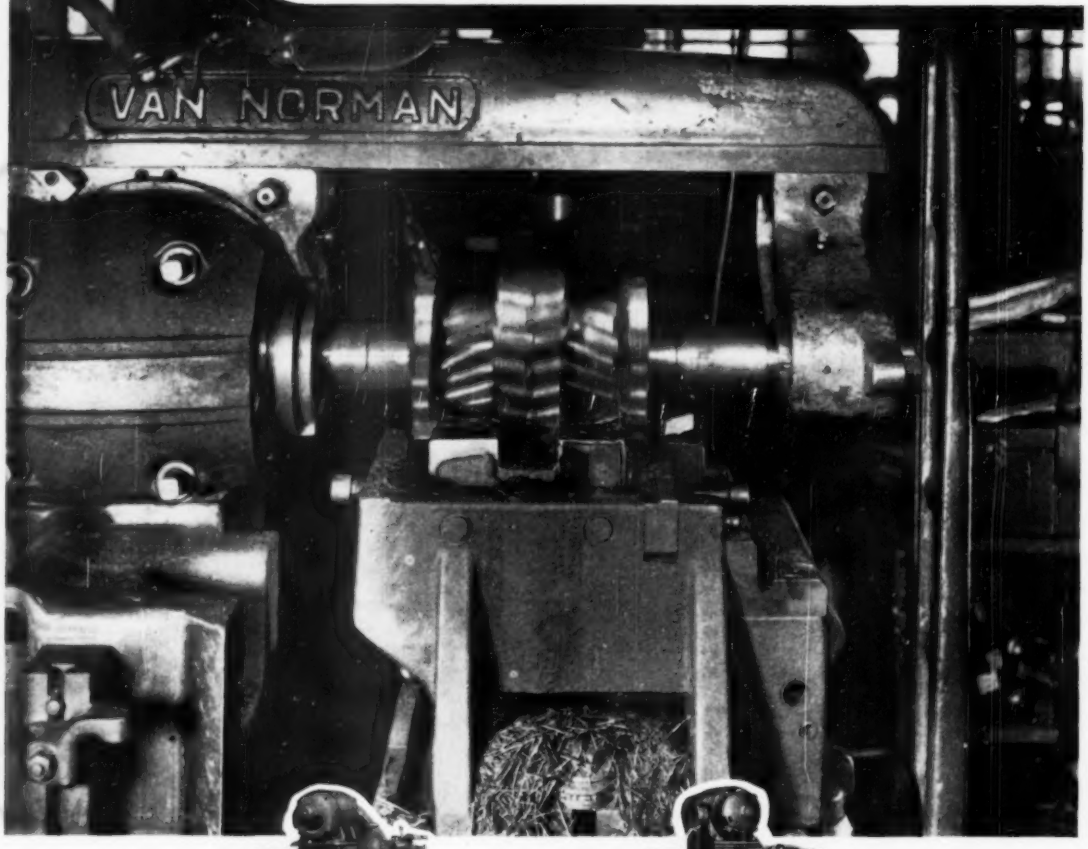


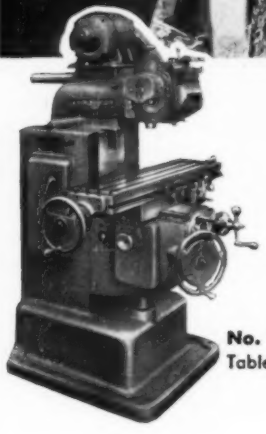
Cutting 6 hours production time to 3 hours floor-to-floor is mighty important in either production or jobbing-shop gear cutting. This is only one of the record performances of the new Fellows 36" Gear Shaper. Here is a machine ruggedly built for heavy cuts, which at the same time produces a smooth finish with a high degree of accuracy. This all-purpose Gear Shaper is adapted to cutting external and internal spur and helical gears up to 36" pitch diameter. Twelve quick-selective spindle speeds provide up to 300 strokes per minute... easy to operate, quick to set up. We would like to send you a brochure of interesting studies of typical production performances on this machine. Contact our nearest office.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont
Branch Offices: 616 Fisher Bldg., Detroit 2 • 640 West Town Office Bldg., Chicago 12 • 7706 Empire State Bldg., New York 1.

Van Norman





No. 16
Table: 37" x 9½"

No. 22L
Table: 45" x 10"

Ram Type Millers

Increase Productivity Wherever They Are Used

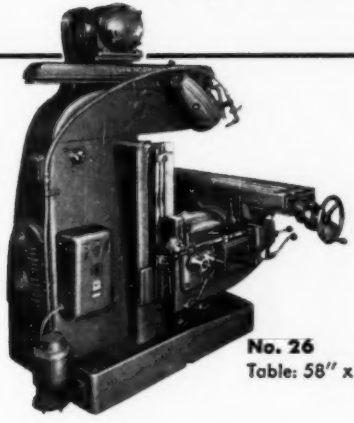
Whether it be in the toolroom, production department, machine shop or laboratory, Van Norman Ram Type Millers increase milling output and cut cost.

Here's how these versatile milling machines enable you to perform horizontal, vertical and angular milling on *one* machine. Simply position the adjustable cutterhead in the required position, lock and you are ready to proceed with the work. They minimize down time for work reset-ups because most jobs can be carried through to completion in the original set-up. In addition, the adjustable cutterhead in combination with the moveable ram and saddle cross feed increases the work range of these millers. Ease of operation is assured with the conveniently grouped operating controls, large easy-to-read dials and quick change speed and feed selectors.

Van Norman Ram Type Millers are available in a wide range of sizes with plain and universal saddles to meet practically all milling requirements. Write for information.

VAN NORMAN COMPANY
SPRINGFIELD 7, MASSACHUSETTS

"It pays to Van Normanize"



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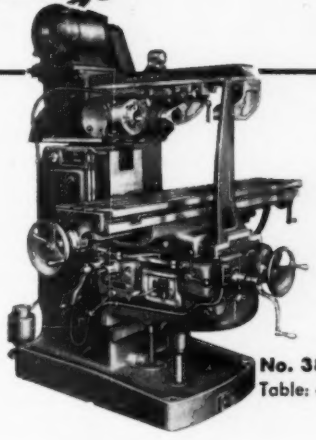


No. 38
Table: 64" x 14"

LANDIS 4 Spindle

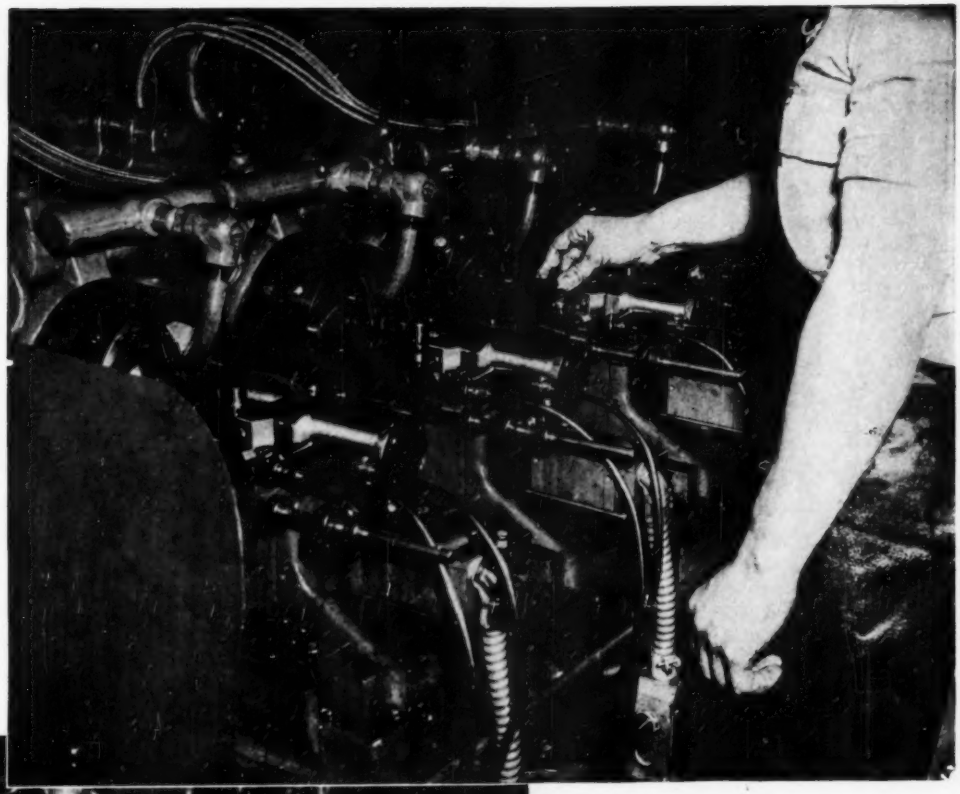
SEMI-AUTOMATIC THREADING MACHINE

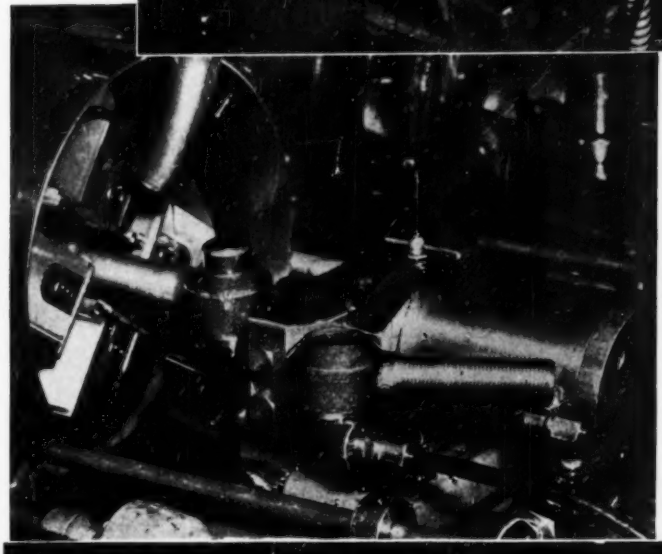
The Landis 4 Spindle Semi-Automatic Threading Machine is a precision machine designed for threading automotive parts, bolts, studs, rods, etc., on a high production basis.

Due to exclusive features in design it offers an unusually high percentage of efficiency.

Outstanding advantages are: High Production at Low Threading Speeds, Quick Set-Ups, Flexibility for all Diameters and for Special Threading Operations, Elimination of Side Shave at Start of Thread, and Thread Concentricity.

For detailed information write for Bulletin E-88.





Threading Tie Rod Ends—upset forgings — 140 to 183 Brinell hardness — ⅝" diameter — 18 pitch threads — 2.125" long — Class 3 fit—at rate of 650 per hour.

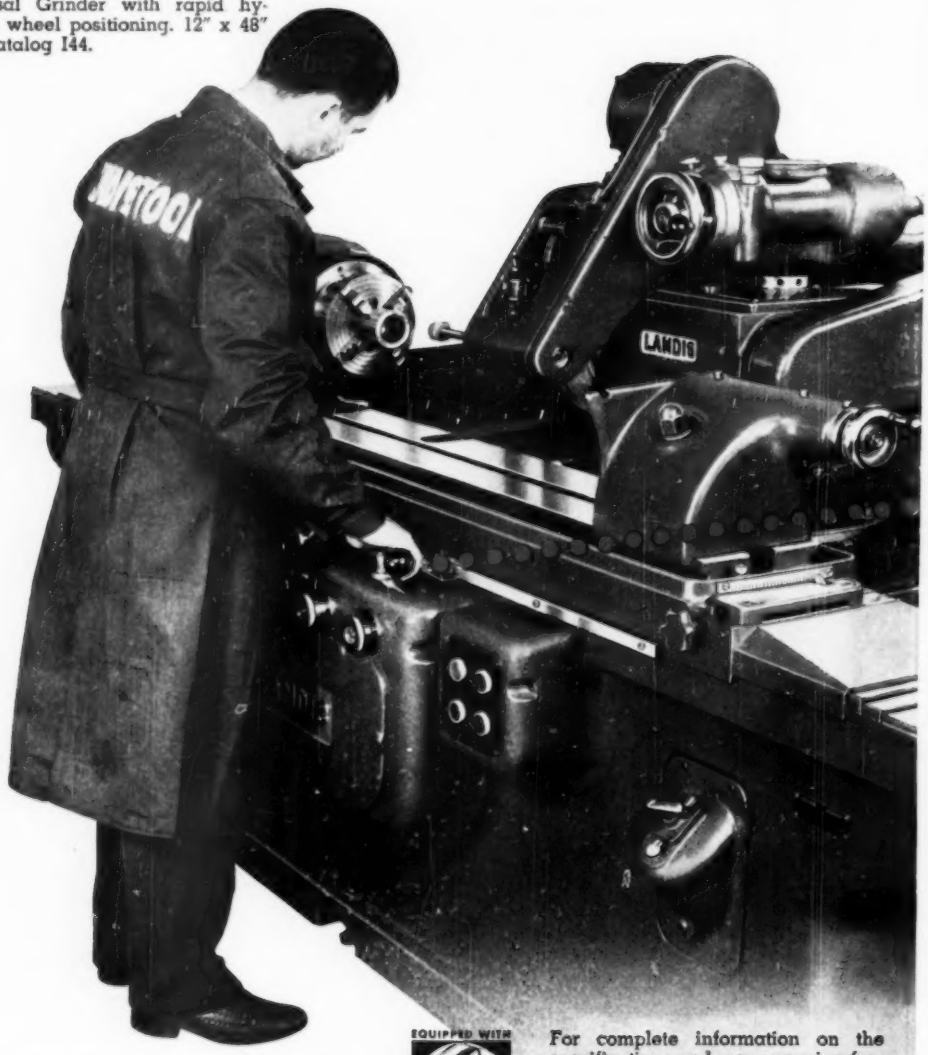
Average production ranges from 500 to 2000 pieces per hour, depending upon diameter and thread length.

LANDIS TRADE MARK

MACHINE CO. WAYNESBORO PENNA. U.S.A.

A NEW SETUP TIME SAVER

Operator setting up for internal grinding. LANDIS TOOL Hydraulic Universal Grinder with rapid hydraulic wheel positioning. 12" x 48" LCH Catalog 144.



LANDIS TOOL
Precision Grinders

EQUIPPED WITH MICROSPHERE BEARINGS

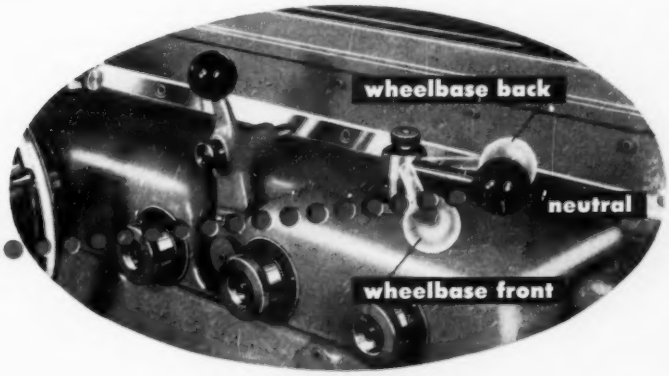
For complete information on the specifications and money saving features of LANDIS TOOL Precision Grinders, refer to our section in Sweet's Catalog File or write for our new condensed catalog.

ON LANDIS TOOL UNIVERSALS

rapid hydraulic wheel positioning

1. Gives big savings where setups are frequent
2. Wheel positioning time cut 50% or more
3. Reduces operator fatigue

you move a lever



instead of positioning by hand

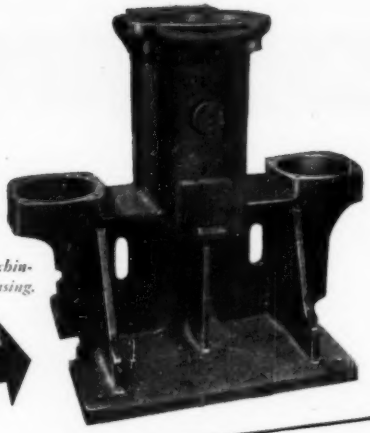
features of LANDIS TOOL Hydraulic Universal Grinders

1. MICROSPHERE WHEEL SPINDLE BEARINGS
2. EYE LEVEL WHEEL FEED
3. HYDRAULIC OPERATION
4. VARIABLE SPEED HEADSTOCK
5. RAPID HYDRAULIC WHEEL POSITIONING
6. SWINGING INTERNAL FIXTURE

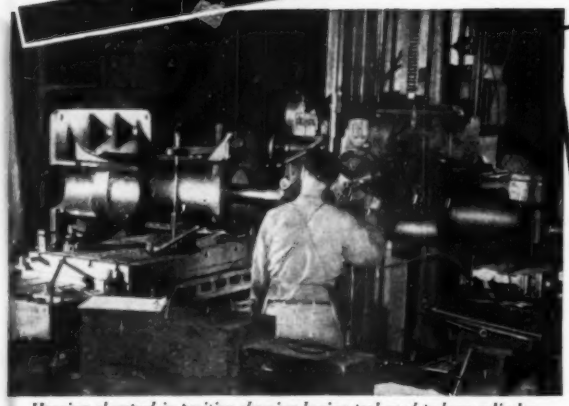
LANDIS TOOL COMPANY / WAYNESBORO, PENNA.

G&L PRODUCTION FACTS *on a typical job*

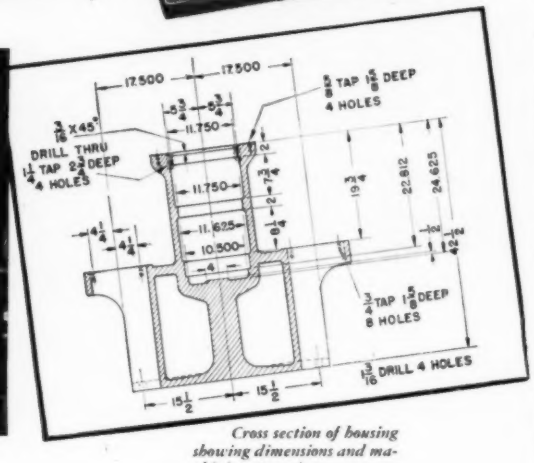
1 Eight Hours Production Time Saved
2 Accuracy Improved
3 Two Set-ups Eliminated
4 Layouts Eliminated
5 Two Machines Replaced



Eight hours saved in machining this semi-steel housing.



Housing clamped in position showing boring tool used to bore cylinder.



Cross section of housing showing dimensions and machining operations necessary.

1 Present floor-to-floor machining time on this cast semi-steel housing is 9½ hours. Formerly the same job on a vertical lathe and drilling machine required 17½ hours. The G&L Horizontal Boring Machine saves eight hours on each casting machined.

2 Two set-ups were required to face and bore this casting on a vertical lathe. The housing is now mounted on a plate or base which in turn is clamped to the horizontal boring machine table. Instead of unclamping the work, the part and base is turned 180° for facing and boring operations.

3 Because all boring, milling, drilling and tapping operations are completed before the work is unclamped, overall accuracy is greatly improved. Bored and drilled holes and milled surfaces are always in correct alignment with each other.

4 Layout is not required before the casting comes to the machine. All holes are drilled using the machine scales and verniers for correct hole location Drilling and tapping operations are simplified.

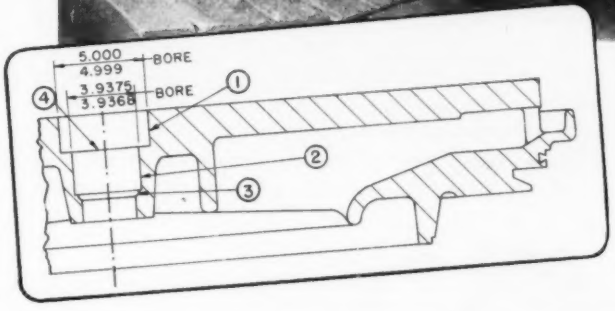
5 The G&L Horizontal Boring, Drilling and Milling Machine replaced a vertical lathe and a drill press Production was increased and machining costs were reduced for unnecessary work handling was eliminated Drilling and tapping operations are performed on the horizontal mill without disturbing original work setting

Now is the time to analyze your own production methods. You may be able to make similar savings with the G&L Horizontal Boring Machine. Our staff of experienced engineers will be glad to help you with your machining problems. There is no obligation for this service Merely submit the problem.

GIDDINGS & LEWIS MACHINE TOOL COMPANY
FOND DU LAC, WISCONSIN, U. S. A.

THIS SIMPLE WORK SET-UP OFFERS SHORT CUT IN REDUCING PRODUCTION COSTS

Simplicity of work set-up results in lower overall production costs. Note how this table top is chucked with face plate jaws. Similar setups on more complicated work are made just as easily.



Operations and finishes are indicated in this line drawing. One bore is held to .0007" which is not unusual for this machine.

Similar Parts are handled Faster and Better on a Cincinnati Hypro Boring Mill — Multiple Boring and Turning Operations Can Be Made Simultaneously On This Machine.

Time consuming and elaborate work set-ups are often unnecessary to position castings and fabricated parts for precision machining operations on the Cincinnati Hypro Vertical Boring and Turning Mill. An excellent example of a simple set-up is shown. This is a precision rotary table top and the center pin hole is being bored and turned. Four ordinary face plate or boring mill jaws are used to hold the workpiece. The table top is merely placed in position and clamped. Holding blocks interspaced between the jaws rigidly support the work.

The turret of the right hand head is tooled to rough and finish bore and to turn the bottom of the counter-bore in this center pin hole. Were additional operations required, more tools could be mounted on the turret, the left hand swivel head and the side head.

All heads on the machine may be operated independently or simultaneously. A pendent station is always convenient to the operator to eliminate awkward positions in the control of the machine.

A surprising number of castings and weldments requiring a broad range of operations can be handled just as effectively and almost as simply as this precision rotary table top. *You can save work handling time, setup time and machining time when you use Cincinnati Hypro Boring Mills.* An inquiry now directed to experienced Cincinnati Planer Company engineers may easily result in better machining methods that will drastically cut your overall production costs.

A Cincinnati Hypro Vertical Boring Mill catalog will be sent Free upon request. Kindly ask for catalog No. 133.

THE CINCINNATI PLANER COMPANY

(SUBSIDIARY OF GIDDINGS AND LEWIS MACHINE TOOL COMPANY)

CINCINNATI 9, OHIO, U. S. A.

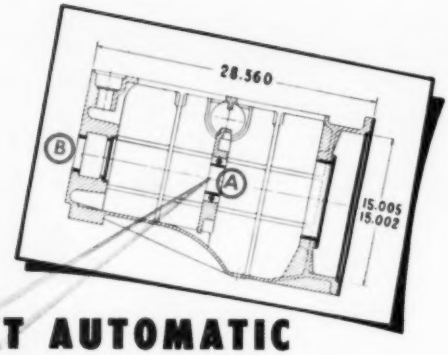
HYPRO

Precise and regular as clockwork...

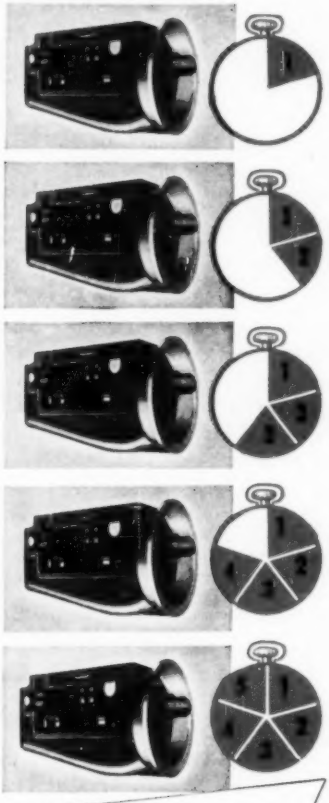
5 PER HOUR

ON THE

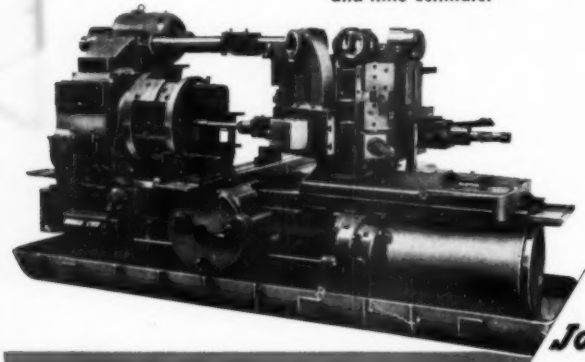
POTTER & JOHNSTON 8DXT AUTOMATIC



23 operations on this Crankcase are indicated by the heavy lines in the drawing — all precision-machined *in one holding* on the P&J 8DXT. The smaller size of the middle bore "A", in relation to the back bore "B", presented a problem. Skillful P&J Tooling solved it, and delivered excellent productivity by completing the job at the rate of one *Crankcase every 12 minutes* at 85% efficiency.



It's the combination of the P&J Automatic and P&J Tooling — in this case the special work-holding fixture plus the P&J-engineered cross slide and turret Tooling — that accounts for the elimination of all unnecessary work handling. Many cuts are combined, and machining time is lowered. As a result, operating costs are greatly reduced. You can attain the same economy-advantages in any multiple operation work on castings and forgings by getting a P&J Tooling recommendation. Simply send a sample part or prints for a tooling and time estimate.



8DXT AUTOMATIC
for work requiring up to '36" swing over bedways

Potter & Johnston Company
Pawtucket, R. I.
subsidiary of Pratt & Whitney
Division Niles-Bement-Pond Company

P&J

Why does he Count his chickens ...before they are "vaxed"?

"Now we've seen everything!" Every time we say that, we can count on it that someone will figure out a new way to use counters. There was the drink-dispenser, the Iron Chinaman, the map-making machine, the fishing reel, the ship's sextant, the exercise table, the bowling-pin setter and countless others.

Then came the egg-grader. So it was only a matter of time 'til another inventive mind combined a counter with a vaccinating device, to keep count of his birds as he needled them!

But why all the figuring on how to use counters? Because Veeder-Root Counters add a new usefulness to any product into which they are built as standard equipment . . . a new sales stimulant, a new profit-producer. Now, let's get together and see what counter-use we can figure out for *you!*

SMALL RESET COUNTER

counts strokes, revolutions, pieces, operations, etc. Easily built into any type of product. Write for spec-sheet on this counter, and for Condensed Catalog.

VEEDER ROOT INC., HARTFORD 2, CONN.

In Canada: Veeder-Root of Canada, Ltd., 955 St. James Street, Montreal 3. *In Great Britain:* Veeder-Root Ltd., Kilspindie Rd., Dundee, Scotland.

Veeder-Root COUNTERS

Reduce Finishing Costs

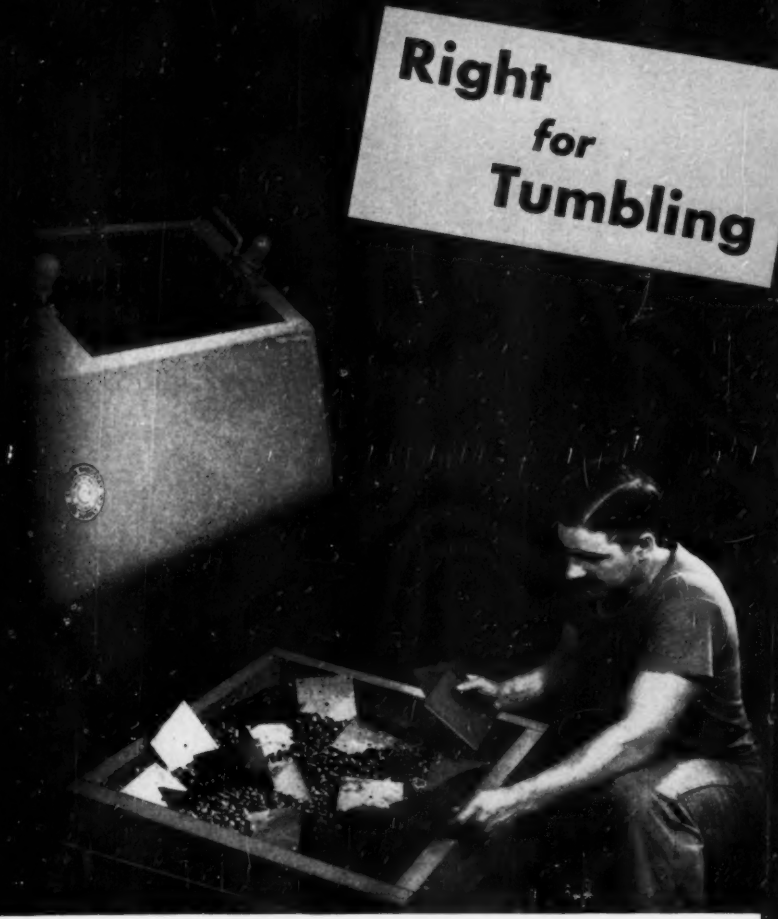
Right for Polishing

ALUNDUM Polishing Abrasive is available in a wide range of sizes and with special surface treatments to meet the exact requirements of every polishing job. For helpful polishing tips and for full details on cost-cutting ALUNDUM abrasive see your Norton distributor — or write for a free copy of the booklet "Setting-up Metal Polishing Wheels and Belts."

NORTON COMPANY, WORCESTER 6, MASS.

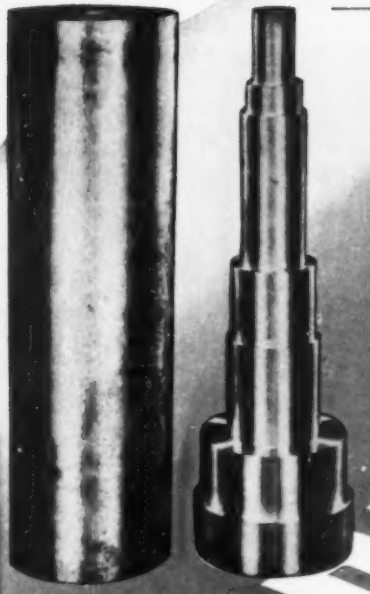
Distributors in All Principal Cities

with ALUNDUM Abrasive!



ALUNDUM Tumbling Abrasive is an ideal tumbling medium because—it's ***all abrasive*** for a continuous cutting action—it's ***heavy*** for the fast, positive cut—it's ***hard and tough*** for a long productive life. Contact your Norton distributor for full details, or write for the helpful booklet "Precision Tumbling with ALUNDUM Abrasive."

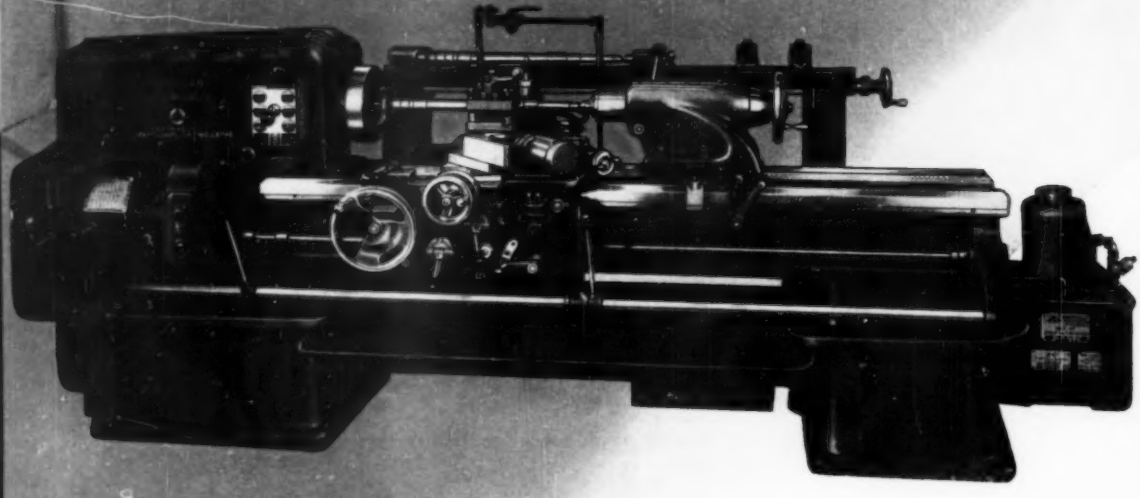
NORTON ABRASIVES



- **Duplicator Time 14 Minutes**
- **Former Time 48 Minutes**

Material.....4¼" SAE 4140
Depth of Cut.....½".
Speed.....255 r.p.m.
Feed.....018".
Total Time,
floor to floor...14 minutes.

PRODUCTION COSTS



THE AMERICAN TOOL WORKS CO.

SHATTERED

4¼" step shaft of SAE 4145 steel being machined complete in 14 minutes on 16-inch "American" "H S-D" Lathe.

. . . by the new Hydraulic Duplicating technique introduced by "AMERICAN"

The new "American" Hydraulic Shaft-Duplicating Lathe is a thoroughly engineered development for reproducing work shapes from a template by means of a hydraulically controlled cutting tool. The template holder and tracer head are built in at the rear of the lathe where they will not obstruct the operator's vision of the work or interfere with loading and unloading. All operating controls are located at the front of the lathe.

It is faithful and accurate in its reproduction.

It will reproduce steps, tapers, right angle and tapered shoulders, recesses, grinding necks and radii and is especially adapted to the production of such work as spindles, motor shafts, valve stems, back shafts, piston rods, axles—and a wide variety of chuck work having irregular contours.

A single hydraulic system is employed for operating the hydraulic tracer valve and the piston which controls the movement of the tool slide carrying the cutting tool. This simplicity is an outstanding feature and insures accurate reproduction, freedom from failures and elimination of work rejects.

This new metal cutting technique permits continuous cutting without interruption for measuring or calipering at feeds and speeds to the cutting limit of Cemented Carbide tools. "Miking" is confined to the first diameter only after which all other diameters are secured automatically.

This machine may be quickly converted to standard lathe operations.

Descriptive Bulletin No. 35 sent upon request.

Cincinnati, Ohio, U. S. A. **LATHES AND RADIAL DRILLS**

Boost net output per machine

Install
AUTOMATIC ROD MAGAZINES
on your
Brown & Sharpe Automatics

3 EFFICIENCY-BOOSTING ADVANTAGES

- Magazine inserts bar automatically as needed . . . in minimum amount of time.
- Greatly simplified restocking provides ample time for operator to supervise quality and finish of work more closely . . . and on more machines.
- Increased net production more nearly approaches gross or geared output.

BROWN &

BETTER WORK — LOWER COSTS

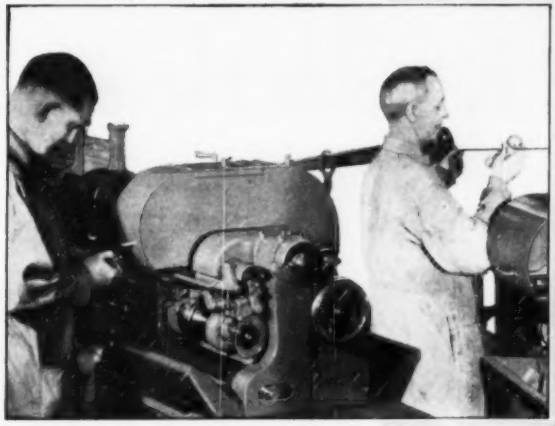
With the Automatic Rod Magazine, a screw machine operator is free to check work pieces more frequently and to pay closer attention to tool conditions . . . maintaining desired quality and producing parts at a minimum cost.

INCREASED OPERATING EFFICIENCY

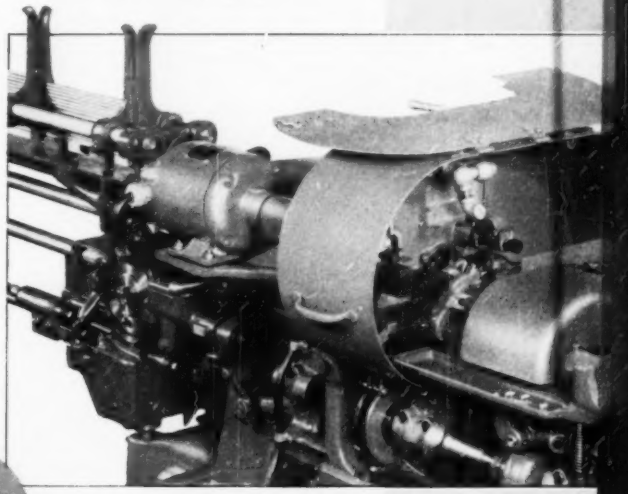
Here's how the Brown & Sharpe Automatic Rod Magazine increases operating efficiency. (1) The magazine permits loading of stock at any time (2) The feeding mechanism takes a new rod automatically the instant it's needed and feeds it into position for trimming.

Electrically-controlled magazines are made for Brown & Sharpe Nos. 00G and 0G Automatic Screw and Cutting-Off Machines . . . also for Automatic Screw Threading Machine. Mechanically-operated magazine is made for No. 2G Machine. Magazines take commercial 10 ft. bars; 12 ft. capacity . . . table.

Investigate the production ... antages of Automatic Rod Magazines for your plant. Send for complete information. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.



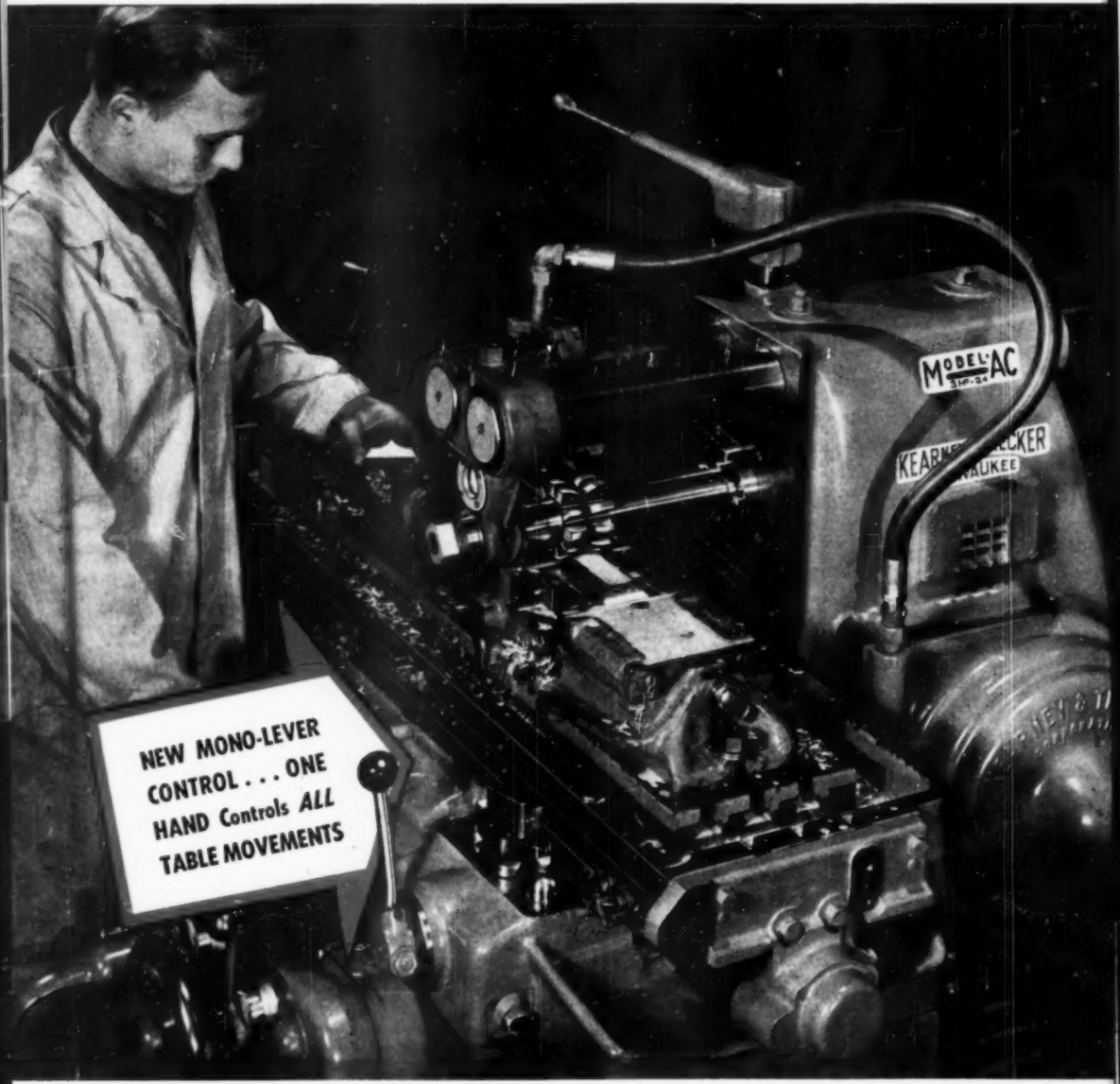
Compare the value of these screw machine operators. In foreground, operator utilizes his skill to full capacity because his machines are equipped with Automatic Rod Magazines that require infrequent stocking. Other operator must spend much of his time restocking — less time on tool maintenance and quality of work.



Every 3½ minutes this Automatic Screw Threading Machine consumes a 10 ft. bar, ¼" diam., in making screws like those shown at left. Its Automatic Rod Magazine holds 33 of these bars — two hours' supply. Magazine can be reloaded any time during this period. Without magazine, reloading involves over 15 interruptions an hour, making operation of more than two machines and close work-supervision difficult for one operator.

SHARPE B·S

Now in the 3hp range..FOUR NEW MACHINES FEATURING



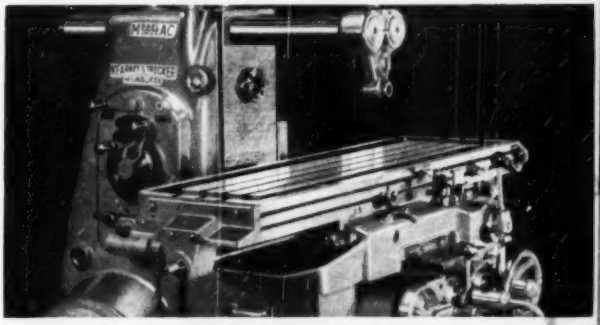
Camera study of good management at work! The job—form mill two radii on medium steel wedge plates. Fine finish required. With new Kearney & Trecker 3hp Model 24-AC machine, operator sets up automatic table cycle for reciprocal milling and easily paces production using climb and conventional milling alternately. RESULT: 28% savings in loading time, reduced scrap, more uniformity, less operator fatigue.

KNEE-TYPE MILLING MONO-LEVER CONTROL

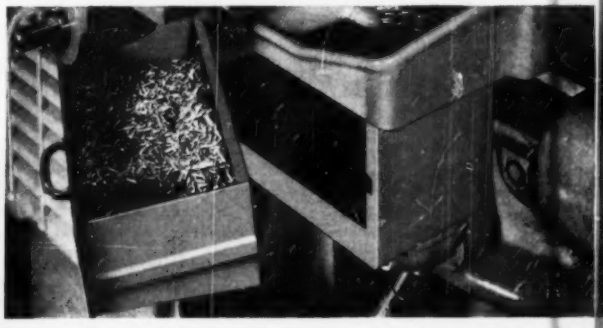
YOU asked for them — Kearney & Trecker milling machines in the 3hp range with Mono-Lever Control and Automatic Table Cycle. Here they are — your choice of two different styles, plain or vertical with either 18" or 24" table feed.

These machines offer you features never before available on machines of this size and type: 33% larger table working area plus built-in deep-well coolant troughs all around — extra large (2" dia.) precision-ground table screw with adjustable nut to eliminate backlash — drawer-type chip containers for easy chip removal — positive metered lubrication of the saddle and table ways and table feed mechanism—six-way power rapid traverse — automatic spindle stop — and quick-change feed and speed selection.

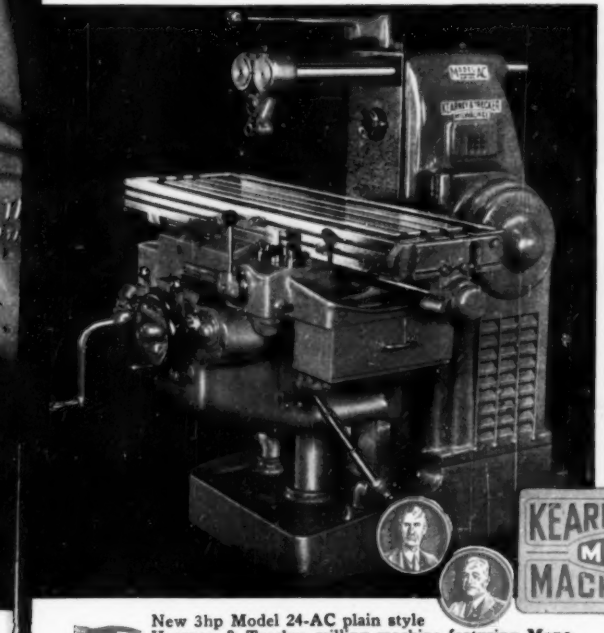
Don't wait. It costs you nothing to find out today about these new machines. See how they can meet all around big or small job requirements in your shop. For detailed information call our nearest representative or write direct to Kearney & Trecker Corporation, 6784 West National Avenue, Milwaukee 14, Wisconsin.



You get 33% more table working area on these new machines — 38" x 14" on Model 18-AC and 44" x 14" on Model 24-AC. This means greater adaptability to handle more jobs.



Convenient, removable drawer-type chip containers simplify chip control and "housekeeping" on the job — improve working conditions for operator—screen chips from coolant return.



KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

New 3hp Model 24-AC plain style Kearney & Trecker milling machine featuring Mono-Lever Control and Automatic Table Cycle . . . ask about it or the vertical style equivalent today!

Adjustable table screw nut on precision-ground 2" diameter screw eliminates backlash—makes climb or conventional milling equally easy . . . assures uniform, accurate results.

KNURLING OF SOCKET SCREWS ORIGINATED WITH UNBRAKO IN 1934

BECAUSE OF THEIR KNURLED HEADS,

UNBRAKO SOCKET HEAD CAP SCREWS SCREW IN *FASTER* AND *FURTHER* BEFORE A WRENCH BECOMES NECESSARY

There is a definite saving of assembly time when you use "UNBRAKO" Socket Head Cap Screws with Knurled Heads. The exclusive knurled heads perform triple duty: (1) *knurling* provides a sure, slip-proof grip; (2) *knurling* permits positive locking—a feature so often essential where there is excessive impact or vibration; (3) *knurling* speeds assembly, because it enables the "UNBRAKO" to be screwed in faster and further with the fingers—handiest of all wrenches—before a "key" becomes necessary.

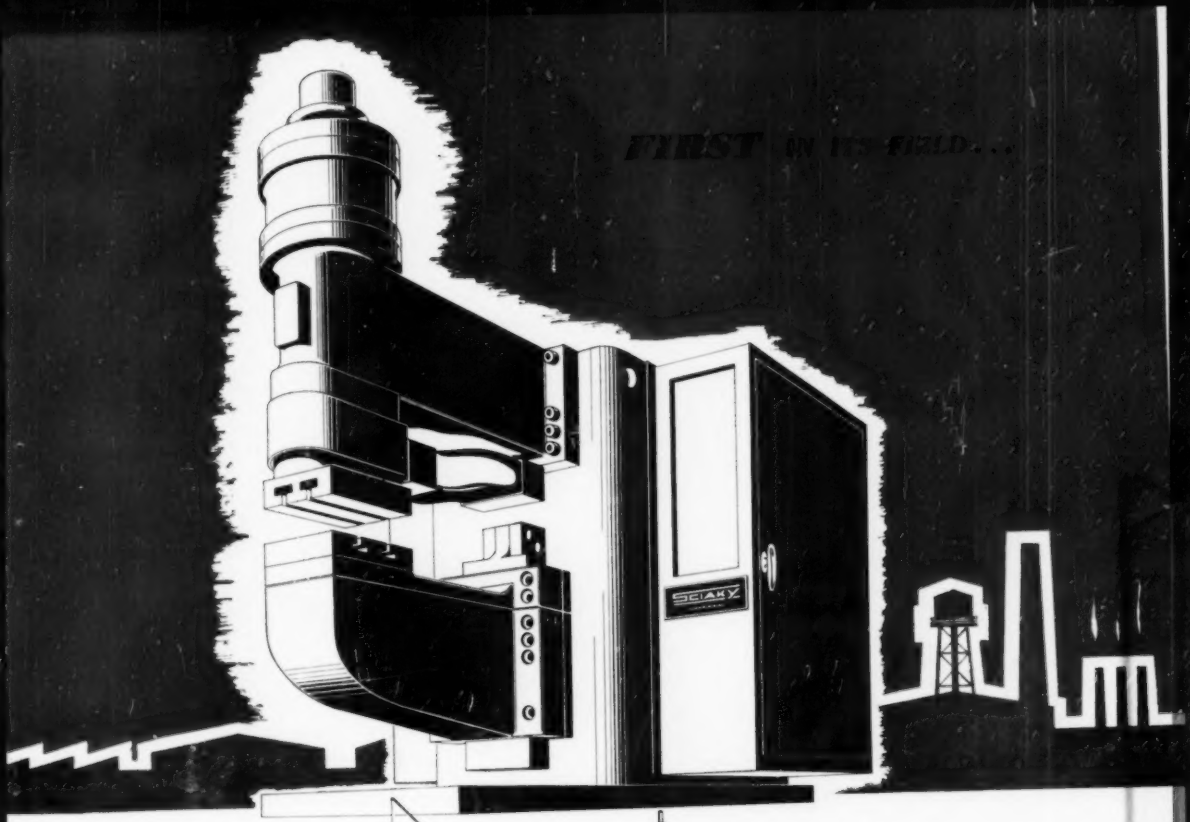
As always, the brand name "UNBRAKO" signifies *great strength* and *precision manufacture to close tolerances*. "UNBRAKO" Knurled Socket Head Cap Screws are available in sizes from #4 to 1" diameter, in a full range of lengths. Other sizes to special order. Write for your copy of the "UNBRAKO" Catalog.

SELF-LOCKING "UNBRAKO" SOCKET SET SCREW WITH KNURLED THREADS PAT'D AND PATS. PEND.
"UNBRAKO" FULLY-FORMED PRESSURE PLUG
SELF-LOCKING "UNBRAKO" SOCKET SET SCREW WITH KNURLED CUP POINT PAT'D
SELF-LOCKING "UNBRAKO" SQUARE HEAD SET SCREW WITH KNURLED POINT PAT'D AND PATS. PEND.
"UNBRAKO" SOCKET HEAD STRIPPER BOLT WITH KNURLED HEAD
"UNBRAKO" PRECISION-GROUND DOWEL PIN

SPS STANDARD PRESSED STEEL CO.

BOX 4 JENKINTOWN, PENNSYLVANIA

"Serving Industry continuously since 1903 through Industrial Distributors"



FIRST ON ITS FIELD . . .

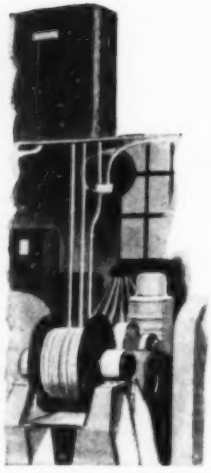
SCIAKY

PIONEERS & INVENTORS

First in

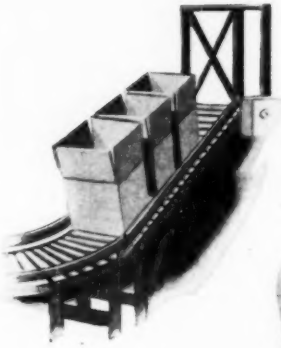
The revolutionary development in the science of electric resistance welding

BEST BET TO



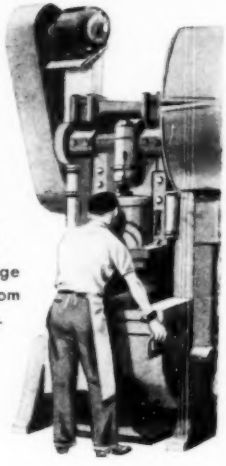
Boosted winding rate 300%

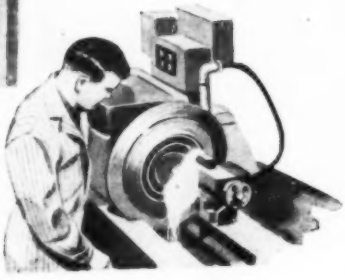
Here's a gain chalked up on the wire rewinders of a Pennsylvania steel company, by installing G-E adjustable-speed drives.



Speeded packaging 55%

Output of a box-sealing machine, newly equipped with adjustable-speed drive, jumped from 38,000 to 60,000 cartons per hour.





Stepped up punching 968%

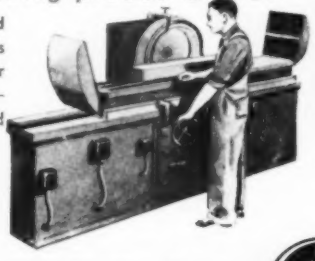
A feat performed on a large punch press, hiking output from 78 to 800 parts per minute.

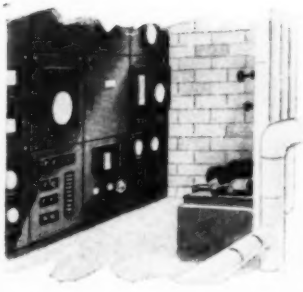
Raised turning output 66%

This was worked out by specifying adjustable-speed drive on an automatic lathe.

Increased grinding production 40%

This gain was achieved on a Buffalo company's face and knife grinder with—you guessed it—an adjustable-speed drive.





Speeded proportioning

A chemical manufacturer found it possible to go from batch to continuous processing in the production of phthalic anhydride by using adjustable-speed drives.

GENERAL ELECTRIC

751-1

BOOST OUTPUT

General Electric adjustable-speed drives can increase the output of your machines—make them more accurate, more versatile

Extra production you never expected may be ready to roll from your driven machines. Call it bonus production, since you get it by using improved speed control, and not by adding new machines. You can expect even more than boosted output from properly applied adjustable speed—it's a single-handed help in improving product quality, minimizing waste of time and materials, and cutting down on rejects.

Adjustable-speed drives have been around for years. But General Electric has brought them to a new high in versatility and power to work production miracles. Now you can buy G-E drives precision-engineered to your machines, at mass-production prices. Now you can choose from a complete line of General Electric Drives—packaged drives providing utmost flexibility. G-E drives offer plants that can use better speed control a quick way to halt the squeeze on profits.

TO UNCOVER OPPORTUNITIES for saving through the application of adjustable speed in *your* plant, General Electric offers this help:

First, the assistance of specially trained sales engineers who bring you the benefits of experience gained in applying adjustable speed to practically every kind of machine in practically every industry. Pick up your phone now and call your nearest G-E field office. You'll find the telephone number listed in your directory.

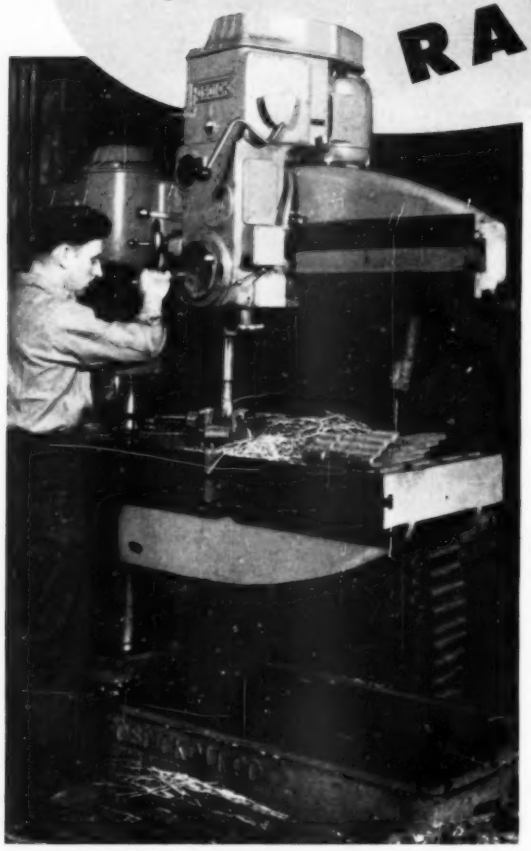
Second, a comprehensive, carefully illustrated book on the *whole* subject of adjustable speed. It's written from management's viewpoint, but backed up with all the facts an engineer needs. Write for your copy. *Apparatus Department, Sec. 751-1, General Electric Company, Schenectady 5, N. Y.*

New G-E Booklet on Adjustable-speed Drives

Your copy of the new 24-page adjustable-speed booklet is ready. Please write for Bulletin GEA-5334 on your business letterhead.

For Sensitive Drilling up to 1 1/2" diameter – use a

FOSDICK *Sensitive* RADIAL



● Your first saving with a Fosdick Sensitive Radial begins at the point of sale as the initial investment is moderate. From then on its many economies are the result of its wide application to sensitive drilling operations and the ease of control and operation. In this new machine you get the sturdy construction and rigidity of a radial plus the high speed characteristics of a sensitive.

Note the installation shown—the work is mounted on an adjustable table which swings in an arc of 360°. You can always locate the table in the correct position for the job at hand. The arm is at a fixed height and also swings in an arc of 360°.

All controls, being centralized on the head, are always within easy reach of the operator from his normal working position. The machine has nine spindle speeds and four spindle speeds and four spindle feeds, fast traverse to the head, table that may be moved by hand or power, a tool ejector and a new patented semi-automatic tapping control.

For all around utility you can't beat this new Fosdick Sensitive Radial. Complete details of construction and operation are available in the Fosdick Sensitive Radial Bulletin S. R. A. Write for yours.

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO

NO SOAP!

This designer of power tools had a brain wave .. Why not scoop competition with a featherweight portable electric drill . . . using a cast magnesium housing? But the boss said, "No soap! Too tricky to machine." Undaunted, the designer got in touch with Aluminum Company of America, light metal headquarters . . . He found that simple shop practices make handling magnesium no problem*. . that every month industry successfully uses over a million pounds of this modern metal. He got valuable technical aid, plus books on designing and fabricating magnesium. From then on, it was a cinch to sell his boss on switching to light, strong, easy-to-machine American Magnesium Castings. Now he's the fair-haired boy at the plant since his magnesium hunch put new sales appeal into their whole line.

*No change in insurance rates.

These two, free books on magnesium and our broad technical experience can help your products, too. Write Aluminum Company of America, sales agent for American Magnesium Products, 2107M Gulf Building, Pittsburgh 19, Pennsylvania.

MAGNESIUM MAZLO PRODUCTS

AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

REAM..... 600 HOLES PER SHARPENING

with

BARBER-COLMAN

HIGH SPEED STEEL

INSERTED BLADE REAMERS

Irregular castings with sand pockets can be mighty hard on cutting tool life — unless of course the tools used on the job are engineered to meet these conditions.

Then, results like these on this 6-cylinder engine block reaming job are standard: 600 holes, 4-5/16" diameter x 8" deep, are produced with one sharpening of the reamer; diameter size is held within .0005"; hole alignment is accurately maintained with Barber-Colman lateral float mounting; reaming time is only 30 seconds per cylinder.

Barber-Colman Reamers and Sharpening are designed to furnish maximum accuracy, tool life and ease of sharpening. As reamers wear undersize, it is only a matter of minutes to set the blades ahead for resharpening. Reamer diameters are easily held within .0002". When you want to ream accurate, straight, round holes, consult Barber-Colman Reamer engineers for recommendations.

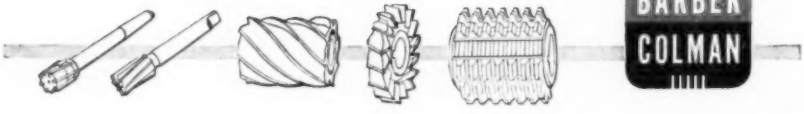
JOB FACTS

Operation — Finish Ream Cylinder Bores
Material — Cast iron with sand pockets
Stock Removed — .020"
Feed — 11/16"/rev. Speed — 30 S.F.M.
Blades — Barber-Colman, High Speed Steel
Production Time — 30 seconds per bore
Tool Life — 600 holes per sharp.
Accuracy — Size within .0005"

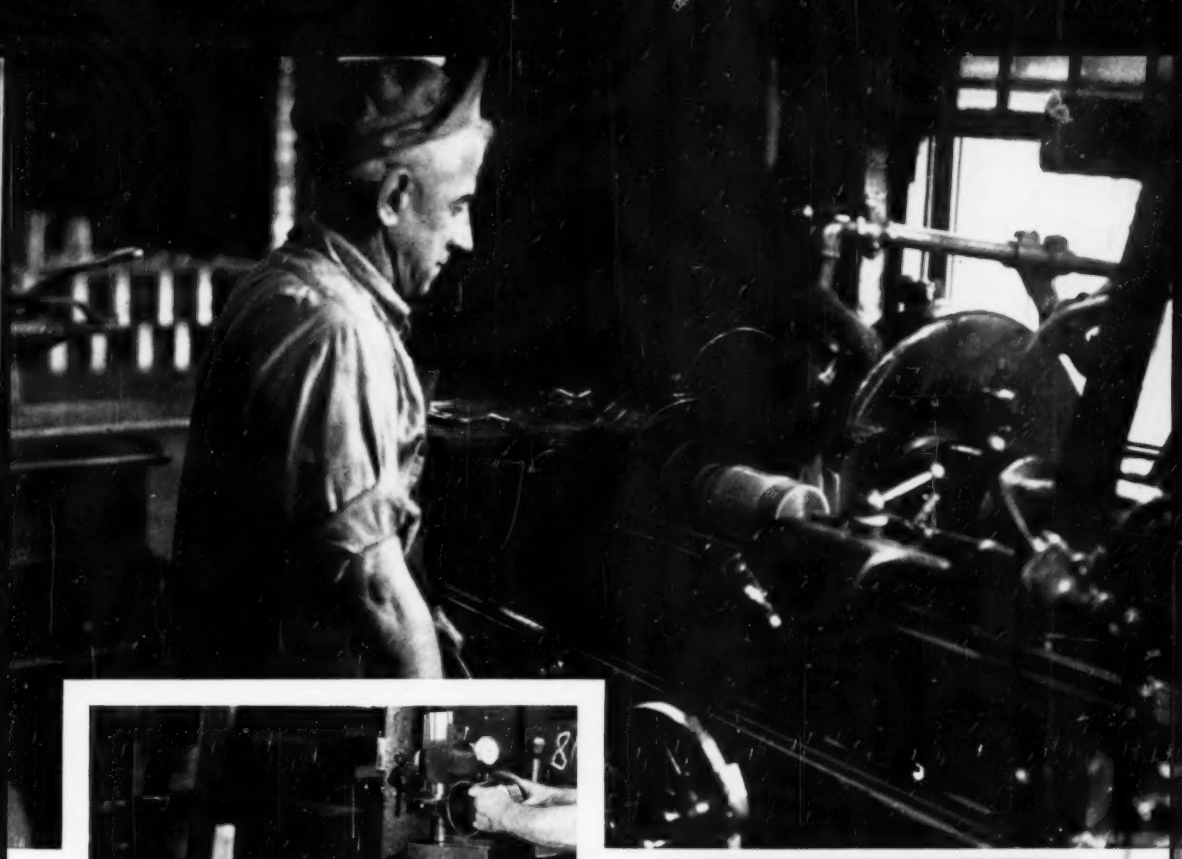
Free Write for additional data sheets covering other reaming applications and performance figures. Ask for series No. 5153.

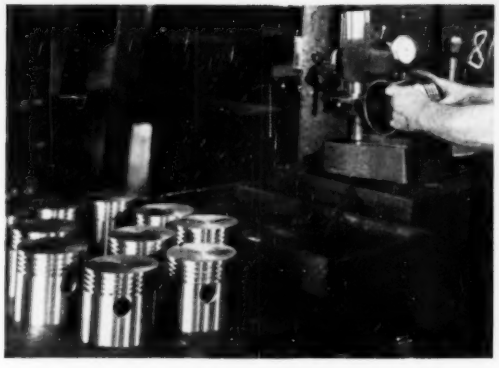
Barber-Colman Company

GENERAL OFFICES AND PLANT, 5153 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.



BARBER COLMAN





SUPERLA Soluble Oil

Gain these benefits for your grinding operations

AIMING at higher production and economy, a midwest plant tried various soluble oils for the cylindrical grinding of cast-iron automotive pistons. Approximately .001 of an inch of stock is removed. Six Norton grinding machines are used on the job.

Of the products tried, Superla Soluble Oil proved superior to any and helped this plant reach its goal through these benefits:

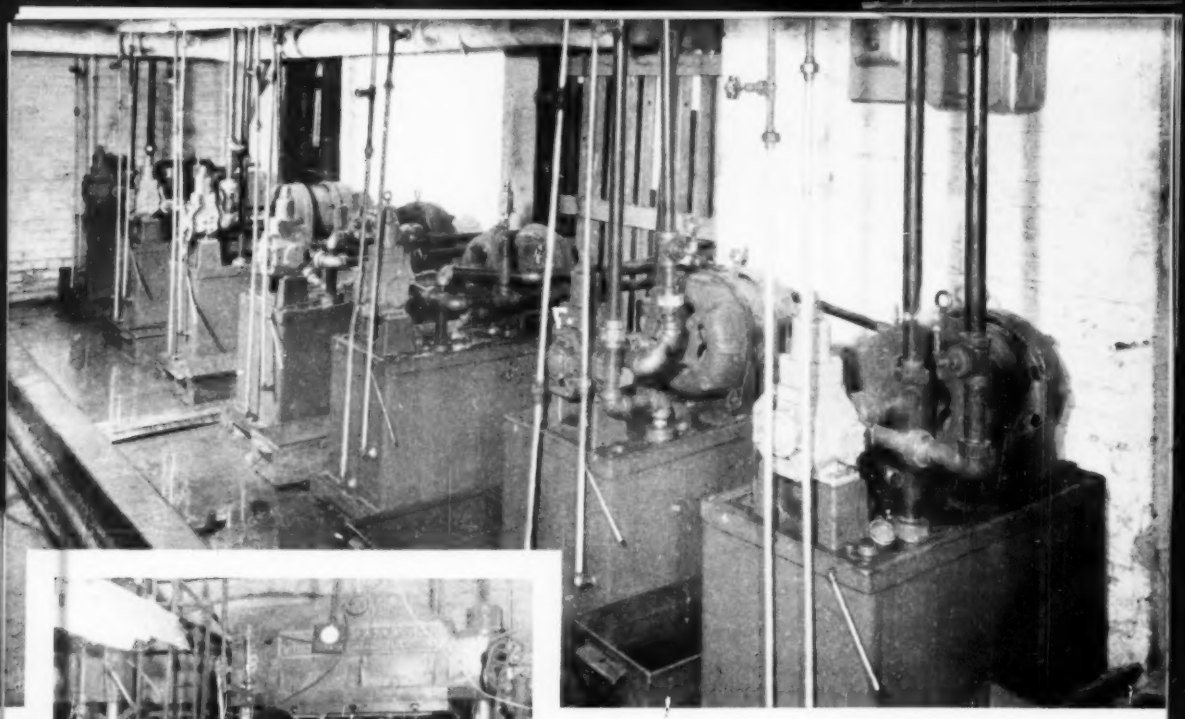
Fewer wheel dressings. 70 to 80 pistons are produced before wheels need dressing as compared to an average of 30 to 40 pistons obtained with other soluble oils. This amounts to a big saving through reduced time and labor for dressing wheels.

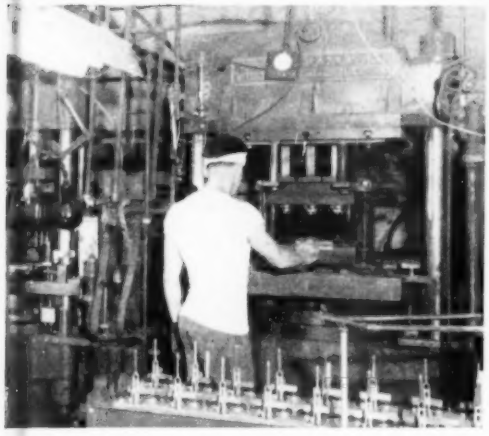
Greater production. Less interruption for wheel maintenance adds approximately 40 minutes to the daily production time of each machine.

The shop foreman reports still other advantages in using Superla Soluble Oil. Piston diameters are easily kept within a tolerance of .0005 to .001 of an inch. There are no rusting troubles. Superla emulsions do not turn rancid and produce objectionable odors.

Why not gain these advantages offered by Superla Soluble Oil —advantages that will help you, in turn, to get greater production and economy in your plant. If your plant is located in the Midwest, write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, to secure the services of the Standard Cutting Oil Engineer nearest you.

STANDARD OIL COMPANY (INDIANA) STANDARD





Stanoil 95 Industrial Oil

Are your hydraulic operations as free of trouble as this?

THE HYDRAULIC UNITS shown above are used for the operation of plastic-moulding presses in a midwest plant. Hydraulic oil pressures reach 2500 psi. Oil temperatures average between 120° and 130° F. Presses, operating on a three-shift basis, require 24-hour operation of the hydraulic units.

Stanoil 95 has been used as the hydraulic medium in these units for well over a year. During this period of hard, continuous service, the hydraulic oil systems have required no cleaning. No oil changes have been necessary. Hydraulic controls have functioned smoothly.

How does this hydraulic oil performance compare with that in your plant? If you are experiencing trouble with oil deposits, oil deterioration, or oil foaming, you can benefit by changing to Stanoil. This multi-purpose industrial oil contains an oxidation inhibitor and an anti-foam additive that contribute to long oil life and clean, reliable operation of hydraulic units, speed reducers, and circulating systems.

If your plant is located in the Midwest, write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, to secure the services of the Standard Oil Lubrication Engineer nearest you.

STANDARD OIL COMPANY (INDIANA) STANDARD

NO. 1 ELECTRIC
⅛" BAR CAPACITY, 11" SWING

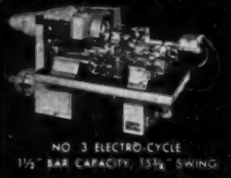
NO. 2 ELECTRIC
1" BAR CAPACITY, 14" SWING

NO. 2 ALL GEARED HEAD
1" BAR CAPACITY, 14" SWING

NO. 2 ELECTRO-CYCLE
1" BAR CAPACITY, 14" SWING

NO. 3 UNIVERSAL
1½" BAR CAPACITY, 15⅝" SWING

1-A UNIVERSAL HEAVY DUTY
2⅛" OR 3" BAR CAPACITY, 16½" SWING



NO. 3 ELECTRO-CYCLE
1½" BAR CAPACITY, 15⅝" SWING

2-A UNIVERSAL HEAVY DUTY
3⅛" BAR CAPACITY, 20" SWING

16" ELECTRO-CYCLE
1½" BAR CAPACITY, 16⅞" SWING

3-A UNIVERSAL HEAVY DUTY
4½" OR 6" BAR CAPACITY, 23½" SWING

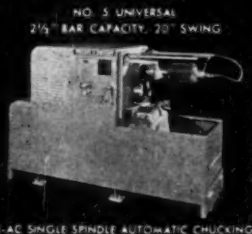
NO. 4 UNIVERSAL
2" BAR CAPACITY, 18⅛" SWING

NO. 10 TAPPING MACHINE
CAPACITY 0-80 TO 10-24

NO. 11 TAPPING MACHINE
CAPACITY 8-36 TO ⅜"

NO. 12 TAPPING MACHINE
CAPACITY ¼" TO 2½"

4-A UNIVERSAL HEAVY DUTY
8", 9" OR 12" BAR CAPACITY, 28¼" SWING



NO. 5 UNIVERSAL
2½" BAR CAPACITY, 20" SWING

5-SPINDLE AUTOMATIC BAR MACHINES
1⅜" STANDARD BAR CAPACITY
2¼" OVERSIZE CAPACITY

5-SPINDLE AUTOMATIC CHUCKING MACHINE
6" SWING

1-AC SINGLE SPINDLE AUTOMATIC CHUCKING
MACHINE, 8" OR 10" CHUCK, 8" TURNING LENGTH

Warner & Swasey

Sells one thing...

INCREASED PRODUCTION

- When you buy a Warner & Swasey, you buy increased production—greater output at lower cost.

The power, rigidity, accuracy, and ease of operation built into each Warner & Swasey all add up to a greater return on your investment.

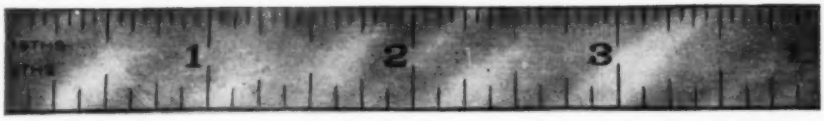
You can machine it better, faster, for less ...with a Warner & Swasey

TURRET LATHES, MULTIPLE & SINGLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES

WARNER & SWASEY
Machine Tools
Cleveland

Van Keuren WIRE TYPE PLUG GAGES

VAN KEUREN FULL 2" GAGE



AGD 1¼" GAGE

WHICH GAGE WILL YOU BUY?

CATALOG AND HANDBOOK No. 34

This 208 page volume represents 2 years of research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

Copies are now free upon request.

Wire Type Plug Gages were originated by The Van Keuren Co. over 25 years ago. In 1948 this design was adopted in shorter lengths as the AGD standard for gaging holes from .030" to .510" diameter. The Van Keuren Co., because of years of pioneering, is able to offer the extra length at little or no extra cost.

You cannot afford to lose this extra length. When you need plug gages obtain a quotation from The Van Keuren Co.—Compare COST PER HOLE GAGED. You can be assured of quality and accuracy. A double inspection at the factory eliminates your inspection expense. No time will be lost waiting for replacements. You can count on prompt delivery from a stock of 2 million wires. Specify Van Keuren wire type gages and get the most GAGE for your GAGE DOLLAR.

Send for Supplement 19 showing quick and easy method of getting 4 to 10 gages from 1 VK wire type gage unit.

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TOOL STEEL **HIGH SPEED**
CHROMIUM PLATE **VK CARBOLOY**
FOR SUPERSERVICE **Phone Watertown 4-4394**

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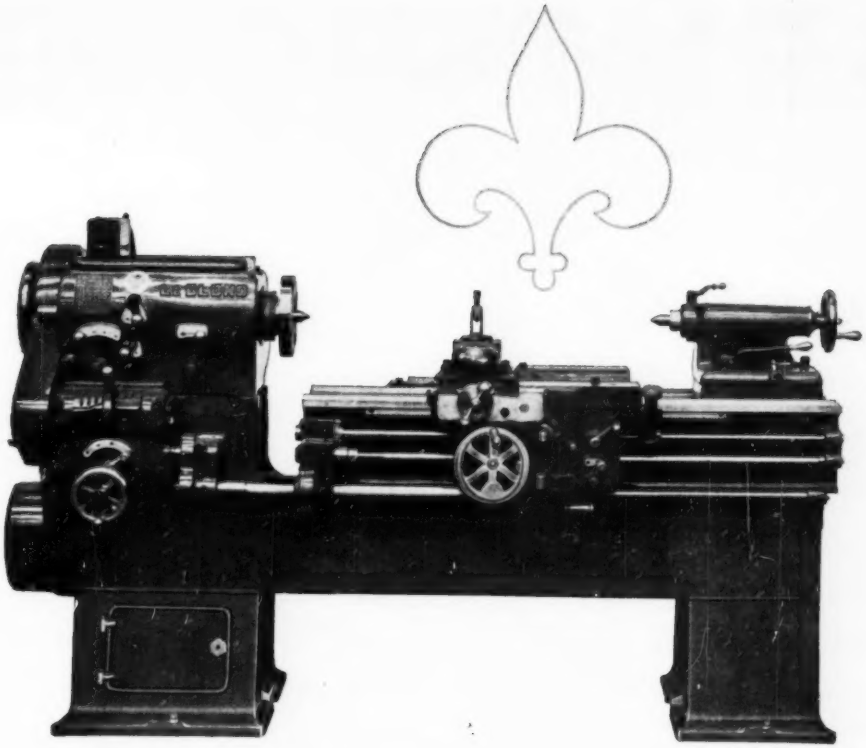
30th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires



LOW PRICED SLIDING BED GAP LATHE
offered for first time by LeBLOND

The new LeBlond 17"/28" sliding bed gap is the first low priced lathe of its type ever offered the metal working industry. The base size machine has a 20" wide gap which increases swing capacity from 17¼" to 30" and center distance from 38" to 58". It is built around the LeBlond Regal, famous the world over for low cost metal turning.

Arranged for 2- or 3-hp 1800 rpm or 3/1½-hp 1800/900 motor, the new 17"/28" Regal will deliver full power for medium duty turning. With single speed motor 8 geared spindle speeds are available ranging from 20 to 425 rpm; with 2-speed motor 16 speeds ranging from 10 to 425 rpm. When furnished with the Gerbing drive, it will deliver a variable number of speeds ranging from 12 to 690 rpm.

Shops requiring the flexible capacity of a sliding bed gap lathe at a low initial investment will welcome the new 17"/28" Regal. For complete information, send today for bulletin RSBG 1.

THE R. K. LeBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO
LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES.
SALES OFFICES: New York, Chicago, Philadelphia, Detroit.

LeBLOND

ARMSTRONG

ARMSTRONG TOOL HOLDERS

answer both . . .

1. **The problem of lowering costs**
2. **The problem of increasing output**

By providing permanent, multi-purpose, inexpensive ARMSTRONG TOOL HOLDERS that use cutters or bits that are quickly ground from standard high speed shapes (Saving: All Forging, 70% Grinding and 90% High Speed Steel), the Armstrong System of Tool Holders will reduce your tool cost to an absolute minimum.

By providing stronger, more efficient tools, carefully developed for each operation, as well as ARMSTRONG High Speed Steel, ARMALOY Cast Alloy Cutter Bits or Armide Carbide-Tipped Cutters as required for each job, ARMSTRONG TOOL HOLDERS permit greatly increased speeds and feeds, enable you to increase the hourly output of every lathe, planer, slotter, shaper, turret lathe and screw machine.

There is no surer way to lower costs and increase output, than to use the correct ARMSTRONG TOOL HOLDER for each operation on all machines.

Stocked by Leading Tool Departments

ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

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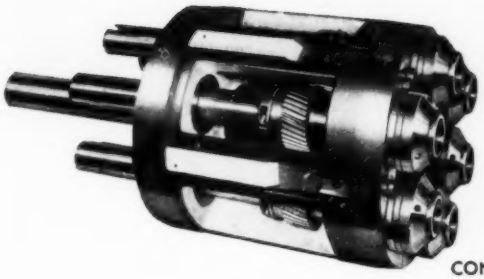
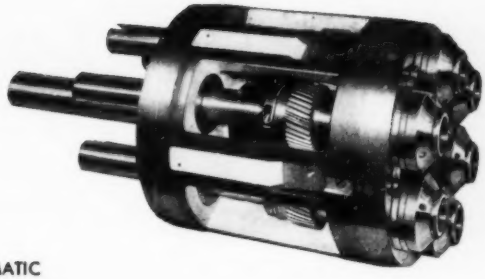
New York and San Francisco

Write for New S-48 Catalog just released.





CONOMATIC
1½" 6-Spindle
CARRIER

CARRIER FRAME INFORMATION		CARRIER FRAME INFORMATION
Rugged	ARE YOU	1. One piece — 615 pounds 2. Nickel Moly Iron (normalized) 3. Overall Length — 20" 4. Bearing Length — 5.04" 5. Bearing Area — 306.6 sq. in. (Full information available)

SUBJECT TO WITHHOLDING?

The withholding of information regarding the facilities of machine tools would be unintentional. But the use of generalizations and approximations, instead of specifications, actually is withholding. Generalizations fail to establish the superiority of a machine's facility through terms which lack a definite basis of comparison. They leave an impression of doubt as to tangible substantiation.

There is nothing definite about a "roomy" tooling area; nothing specific about a "rugged" tool slide, and nothing comparative about a "massive" frame.

The dispensing of machine information is the responsibility of the manufacturer. Realizing this, CONE has prepared an analysis chart that should prove very useful to those seeking more specific information about multiple spindle automatic bar machines. Your copy is free. There is no obligation.

A comparison with ALL Automatics will lead you to

Conomatic

CONE AUTOMATIC
MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

CLEEREMAN DRILLING MACHINES

secure REPEAT ORDERS on the basis of PERFORMANCE

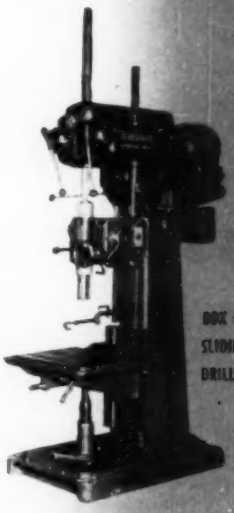
Cleereman Drilling Machines have introduced a new conception of drilling machine performance.

That is why present users send repeat orders . . . they know from their own experience exactly what Cleereman Drilling Machines will do. Prospective users want Cleereman after they have checked performance and maintenance records.

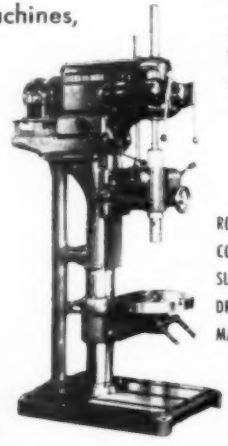
If you do not now use Cleereman Drilling Machines, let us refer you to an installation for your personal inspection.

Write for Catalogs.

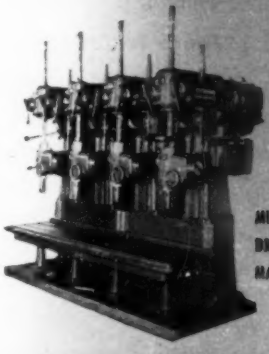
#325 SINGLE UNIT SLIDING HEAD DRILLING MACHINE



BOX COLUMN SLIDING HEAD DRILLING MACHINE



ROUND COLUMN SLIDING HEAD DRILLING MACHINE



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BRYANT Machinery & Engineering Company

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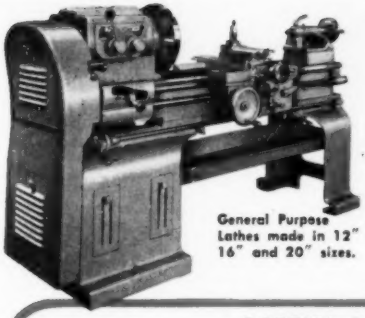
BUILDERS OF PRECISION JIG BORERS AND DRILLING MACHINES



General Purpose Lathes made in 12" 16" and 20" sizes.

SEE YOUR *Sebastian* DISTRIBUTOR

for complete information on this value-leading, medium-priced lathe

Your Sebastian Distributor can show you why the Sebastian Lathe, with a powerful 8-speed geared head . . . Timken bearings on all headstock shafts . . . reverse in apron for feeds . . . 57 feed and thread changes . . . and many more modern design and construction features, represents today's outstanding buy in the medium-price lathe field. Ask your Distributor or write us for Catalog S-1 (Standard Lathes) and S-101 (Special Type Lathes—Gap, Clutch and Brake, etc.).

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CINCINNATI 29, OHIO

Builders of King Vertical Boring & Turning Machines and Sebastian Lathes

BARDONS & OLIVER, Inc. ANNOUNCES A BRAND NEW ROLLER CUTTER TYPE PIPE NIPPLE MACHINE . . . chamfers both ends for threading and cuts off—up to 100 OR MORE NIPPLES PER MINUTE!

. . . why consider a 4 to 8 spindle machine when this SIMPLE and INEXPENSIVE single-spindle machine will produce as many pieces or even more?

DEVELOPED SPECIFICALLY FOR *Highest Production of Pipe Nipples*—

"Also highly productive for many similar parts made from pipe or tubing."

COMBINES ALL OUTSTANDING ADVANTAGES OF BOTH THE ROLLER CUTTING PRINCIPLE AND ALSO THE POWER DRIVEN REVOLVING SPINDLE IN A SINGLE MACHINE

1. Roller Cutter eliminates all cutting waste, thus producing the maximum number of Nipples from a given length of pipe.
2. Power Driven Revolving Spindle lengthens Roller Cutter life, producing 5,000 to 10,000 or more Nipples before resharpening is necessary.
3. Overall lengths of Nipples are consistently held within tolerance of a few thousandths of an inch, without any slowdown in production.
4. Cut off and chamfered ends of nipples are accurate and true running, with smooth finish.

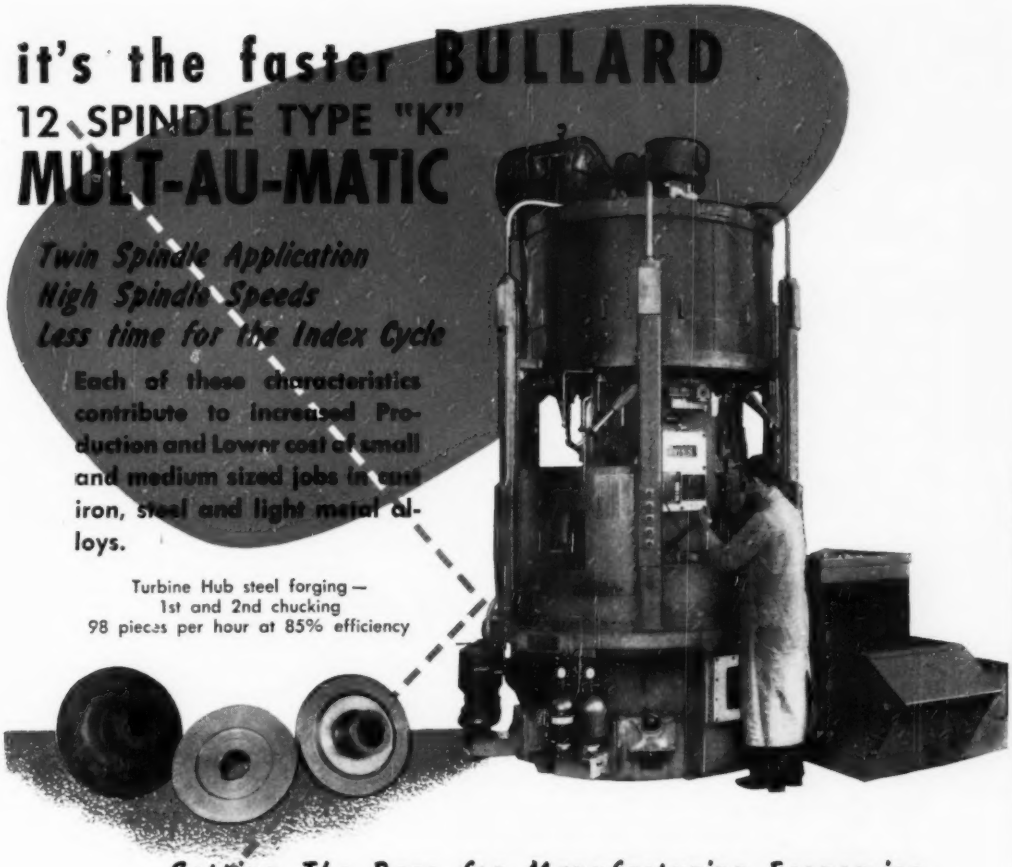
For Further Information, Please Consult

BARDONS & OLIVER, INC. 1133 WEST 9TH STREET CLEVELAND 13, OHIO

it's the faster BULLARD
12 SPINDLE TYPE "K"
MULT-AU-MATIC

Twin Spindle Application
High Spindle Speeds
Less time for the Index Cycle

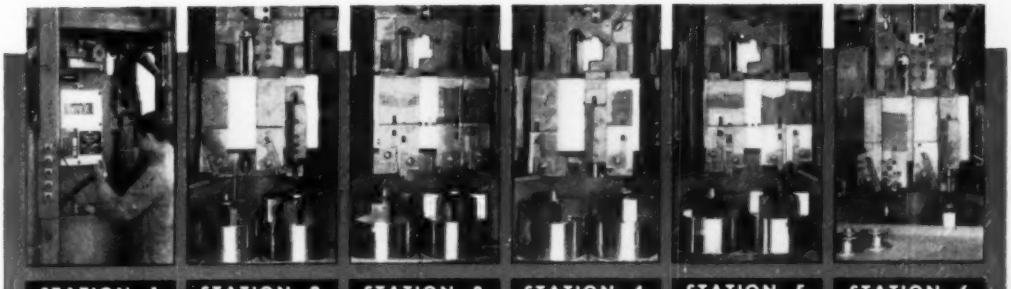
Each of these characteristics contribute to increased Production and Lower cost of small and medium sized jobs in cast iron, steel and light metal alloys.



Turbine Hub steel forging—
1st and 2nd chucking
98 pieces per hour at 85% efficiency

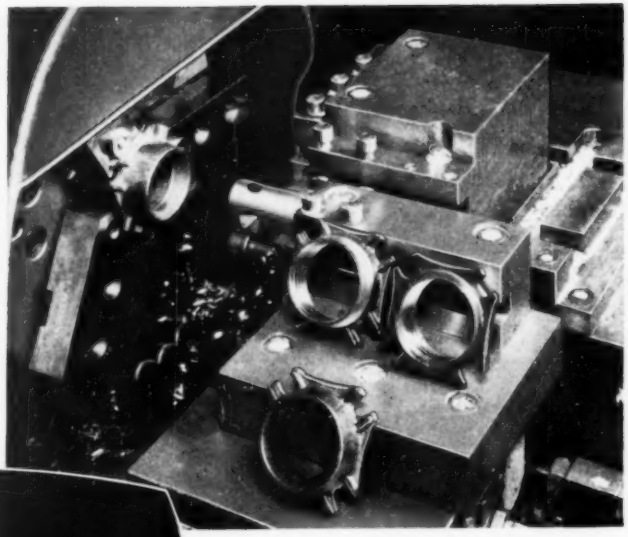
Setting The Pace for Manufacturing Economies

There are 19 operations combined in the 1st and 2nd chuckings. Each index of the machine delivers a finished piece. When writing for information refer to ad XK



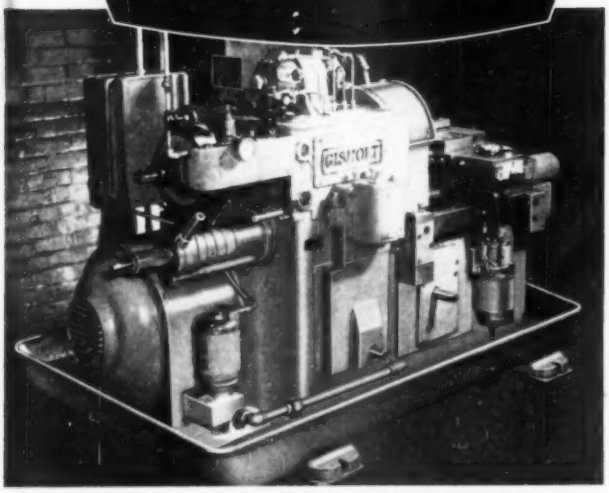
THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

Small Job Shop Catches the BIG IDEA



cuts costs with—

GISHOLT No. 12 HYDRAULIC AUTOMATIC LATHE



No matter whether the shop is large or small . . . if there's volume, there's the opportunity to make money faster with automatic machining.

The Kilbourn Engineering Company of Milwaukee saw it—and proved it again—subcontracting these parts for electric hot water heaters with the Gisholt No. 12 Hydraulic.

Greater Production

With its fast automatic cycle and multiple cutting, the Gisholt turns out these parts at twice the rate of the previous method. A man merely loads and unloads the machine. The owner is not limited to this one job either. It is easily set up to handle a variety of work up to 12" in diameter.

Corner for Profit

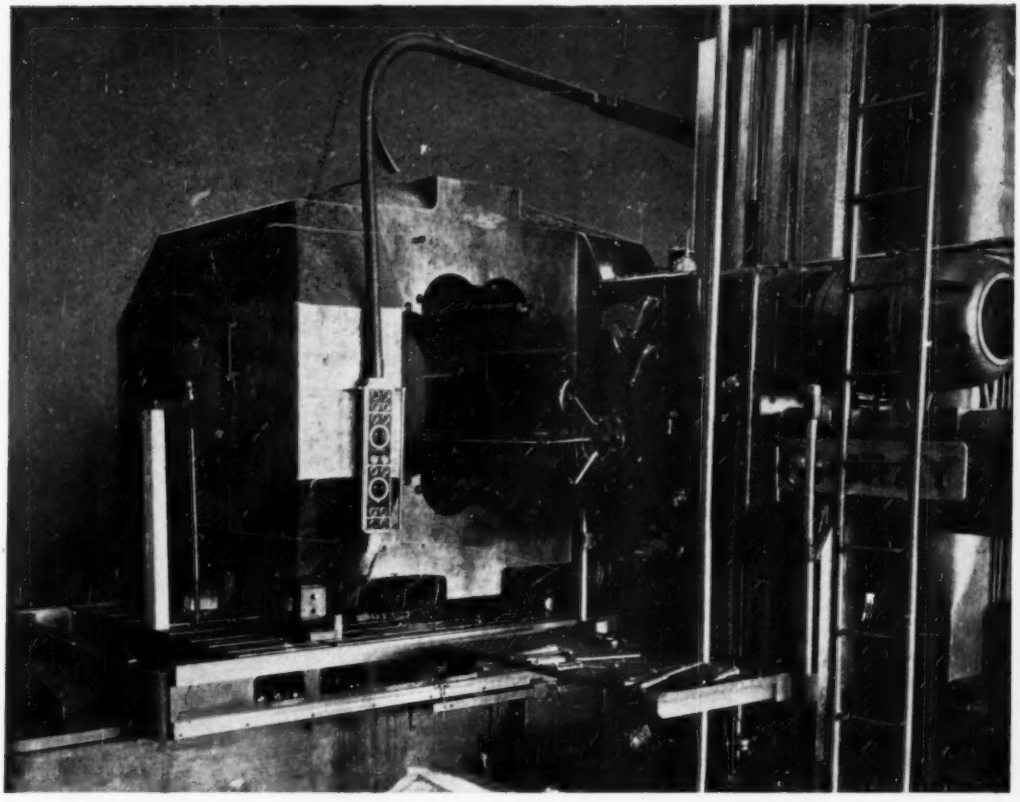
Such work can be highly profitable for job shops. Especially when the whole operation can be tucked into one small corner of the shop as this one is.

Progressive thinking like this is what makes many small shops grow into big ones. Gisholt engineers can help you with all kinds of ideas for making the most of machine tools.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



what a **JOB!** *and "what a mill" it takes to do the job properly . . .*

The task was to bore eight 15" diameter holes in the roll bearing housing of a 38-ton Sendzimir Rolling Mill, and hold it within .001" limits, in spite of the fact that they were segmental holes, and not bored from the solid.

The job was successfully performed on a Gray Planer Type Horizontal Boring Mill in the plant of the Waterbury Farrel Foundry and Machine Co., Waterbury, Conn.

The G.A. **GRAY** *Company*

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.

Put it on the BLANCHARD

. . . for stock removal

These side plates, approximately 9″ x 18″, are ground from the rough on a No. 18 Blanchard with 36″ chuck — requiring 1/16″ to 1/8″ stock removal per side.

. . . for close tolerance

These plates are held flat within .003″, parallel to .001″, and to a dimension tolerance of ±.001″. A Blanchard 20C50 Cylindrical Wheel is used.

. . . for speed

Three chuck loads of 5 pieces each, give a production of 30 surfaces per hour. Feed is .020″ per min.

. . . for comparison

A comparison of the Blanchard Method with your present methods may be a pleasant surprise. May we grind some samples for you?

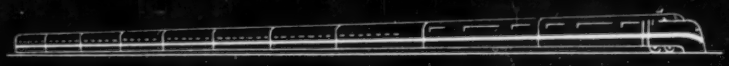
V-348

NO. 18 BLANCHARD SURFACE GRINDER

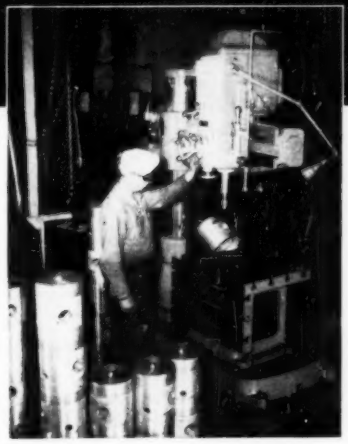
Send for your free copies of "Work Done on the Blanchard," third edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

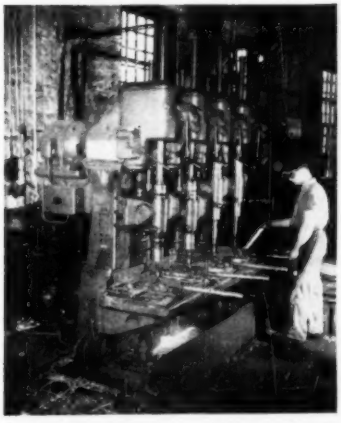
THE BLANCHARD MACHINE COMPANY
64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.



Important in the *Railroad Shop*



Drilling oil hole in aluminum piston.



Gang drilling a $\frac{1}{8}$" hole in mild steel push rod.

PHOTOS—COURTESY BURLINGTON R. R.

Versatile and speedy Cincinnati Bickford Super Service Radial and Upright Drills, using Hi-Speed tools ranging up to $1\frac{9}{16}$", are doing many jobs in railroad shops—such jobs as drilling brake levers, coupler draft keys, coupler yokes.

The handiness of these machines, their ample power for hogging out metal, clean performance and ease of operation are outstanding.

Write for . . .

Booklet R-21-B on 9" Diameter Column Super Service Radials; also Booklet U-25 on Super Service Upright Drills.

Our 75TH Year
CINCINNATI BICKFORD
1874-1949
METAL DRILLING MACHINERY
SUPER SERVICE

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

New Hydraulic Automatic Variable Speed Control for REEVES Motodrive

"Hydraulic Control for the REEVES MOTODRIVE! Now *that is something!* It's just what we've been looking for!"

So say production men everywhere, who have known the accuracy, the versatility and the absolute dependability of the REEVES Vari-Speed Motodrive for years!

Now, with super-sensitive hydraulic automatic control, it is positively unbeatable for all types of installations *where space is at a premium, and operating speeds must be controlled automatically with extreme accuracy and dependability.*

This new control consists of a compact, independent hydraulic power plant and a rotary valve and piston, fully encased and mounted on Motodrive in lieu of the standard, speed-changing handwheel. A few ounces of pressure on the control lever actuates the control to produce changes in output speeds.

The same unit, without the hydraulic power plant, is designed to provide equally accurate and sensitive *pneumatic* control.

The new controls, similar in design to those offered for use with the REEVES Variable Speed Transmission, have been thoroughly tested in service. They are extremely sensitive in operation, soundly engineered, and trouble-proof. They operate instantaneously when speed changes are called for by any indicating mechanism, such as follower roll, float, moving part, etc.

Write today for further information about this important new REEVES development.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

"Sensitive as a cat's whisker"

Completely Automatic Variable Speed Unit and Controls —compact and accurate

ACCURATE • VARIABLE
Reeves Speed Control
GIVES THE RIGHT SPEED FOR EVERY JOB!

Send For New Bulletin A27—GN-4916

Contains complete description, with pictures, of this outstanding new REEVES development.

SPOT NEWS OF METALWORKING

Studebaker has placed large machine tool orders reported to total four to five million dollars for manufacture of a newly designed V-8 engine to be used in its 1951 models. Many of the machines are special purpose and include transfer-type units.

Machine-tool business is popping around Detroit. At least four builders expect within next 30 days to be sold out for 1950 on basis of orders on Ford transmission tooling programs and on tooling jobs for new automobile engines. Two new engines for Ford Motor Co.'s line of cars are being scheduled.

Conversion deals for steel are back in a big way. Several important automobile companies, faced by huge production schedules in the first quarter, have already arranged for conversion steel which should enable them to get enough tonnage to meet their full requirements.

Poor productivity by workers plus their indifferent attitude toward their jobs is main reason why at least two metalworking companies are moving their plants from Detroit to small Michigan towns.

Carbide cutters should be reground when work begins to heat, says one user. It's a new concept. He contends that maximum tool life and cutting speed result when chip load is held very high. When chip load declines, or the cutter starts to dull, heat appears in the work instead of being dissipated in the chip.

Reduction of power for milling resulted in recent tests when chip load and cutting speed were increased. At 300 fpm, 36 hp were required, at 1435 fpm only 29 hp. Tests were on SAE 1030.

Screw-machine cams can be cut to give most efficient feeds and speeds with a machine that will cut a perfect helix directly from engineering computations. Containing three compounded slides, it works on triangulation principle.

Television set production has been skyrocketing. From 178,500 sets in 1947, production went to 975,000 in 1948 and to 2,300,000 or more in 1949. Production in 1951 is expected to hit 4 million sets. High-production tooling going in recently has cut cost. Radio sets (AM) have declined meanwhile from 17 million in '47 to 12.5 million in '48 and 6 million in '49.

A clamping device which facilitates bench operation on light-gage elbows has been developed at a West Coast shipyard. Basically a plate to which is welded a hinged collar clamp, it allows the mechanic free use of both hands, making it possible for one man to do the work formerly performed by two.

A portable bending machine made of high resistance light alloy, for bending copper and aluminum tubes, is being mass produced by a French manufacturer, Etablissements Dard

A new ceramic material which contracts when heated and expands when cooled is being evaluated by Air Force engineers, who believe it may find a wide range of uses in jet engines. It can be formed and shaped by conventional methods of pressing, extrusion and casting.

Kaiser-Frazer's plant at Rotterdam will begin assembling the French "Simca-8" automobile first of the year. There are also plans for assembling the Italian "Lamberta Scooter." Changeover is prompted by fact that devaluation has made the K-F automobile too expensive for Dutch and other European buyers. The Dutch company's present output of K-F cars is twelve a day.

Gaging Metalworking

Metalworking industries are looking forward to a very active January. After allowance is made for holiday interruptions December was a good month, with many manufacturers in both durable and consumer goods putting pressure on to get more output. The steel supply has been the limiting factor and will continue to be the chief bottleneck for the next 60 to 90 days.

The fact is that the entire first half of 1950 should be very brisk in most segments of metalworking. The automobile industry, for one, promises to run in that period at a rate close to, and possibly even greater than, 6 million units a year. There will be no midwinter sag in car production. Stocks of new cars in dealers' hands are considerably lower than they were a year ago. The big automotive producers have taken action through conversion deals to see that they get enough steel during the first quarter.

Steel Price Hike No Surprise

The hike in steel prices of $4 a ton caused no surprise and is being accepted philosophically by users. Large steel consumers have been surprised and gratified that steel mill operations got back up to a high level so quickly after the strike. While some important users are protecting themselves against interruptions in steel flow by making conversion arrangements, others have decided to take a chance on regular mill sources.

No Hot-Rolled Shortages

There apparently will be no serious shortage in heavy hot-rolled sheets and possibly not even in light hot-rolled. The real trouble will be in cold-rolled sheets. Some sizable consumers are protecting their positions on sheet and strip by reserving tonnages through the first quarter. No critical items are reported in plates, bars and shapes. Silicon steel producers should be caught up by early February and some of them sooner.

Machine tool sales to the automobile industry in the early months of 1950 promise to be the best in many years. Tooling programs for new transmissions and new engines will be responsible. Considerable business from these sources was placed during December, but more will be released in January and February. Makers of special purpose machines and of standard machines with special tooling are the main beneficiaries.

Engine Program Allocated

The Studebaker engine program already has been largely allocated among machinery builders. The Warner Gear and Detroit Gear transmission jobs for Ford and Studebaker also are in the works. Ford is expected to be a big buyer of machine tools for two new engines or possibly three. Chrysler still is playing with new engines and is believed to be developing a new unit for Dodge which will be used first in 1952 models. Machine tool builders are bidding on an enormous amount of automotive tooling.

Some improvement is noted in machine tool demand in other directions than the automotive side. Italian buying of U.S. machines is reported stimulated by the unfreezing of credits in this country which have been unavailable since the beginning of Italy's participation in the war. The Italian government is considering the granting of a ten-year credit period during which its own manufacturers may pay for U.S. machine tools made possible by ECA financing.

Television Helps Stampers

Metal stampers are going into first quarter operating at better than 65% of 1948, the peak year, or at about the same level as was maintained this year. Backlogs do not average more than about two months of work but stampers are receiving a steady stream of orders especially from automobile and television makers. Model changes have been extensive in television and that has meant new business for stamping plants. Stampers have been able to secure steel to meet their commitments augmenting their mill deliveries with fill-in tonnages from warehouses.

Gray Iron Steady

Gray iron foundries believe that the tonnage produced the coming year will be about the same as in 1949—about 10 million tons. Orders and inquiries are matching those of a year ago. In the case of nodular

Here's What ECA Countries Expect to Spend for Machinery and Equipment

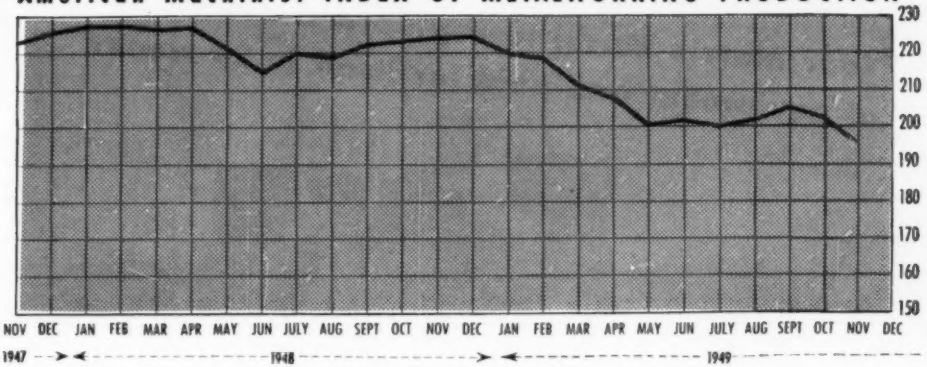
U.S. Dollar Payments Required in 1949-50 on Anticipated Imports

(In thousands of dollars—add 000)

		Metal Processing Machinery Except Machine Tools					
	Machine Tools	Rolling Mill Equipment	Foundry Equipment	Forging Equipment	Metal Forming & Cutting Machinery	Misc. Metal-working Machinery	Portable Metal-working Machinery
Austria	3,200	10,587	15		300	98	
Belgium	3,629	11,700				500	
Netherlands	5,270	9,000	600		1,200	600	200
Denmark	2,400	200	100	5,583		500	
France	15,461	13,521	525	80		1,000	61
Greece	940	80	250			90	90
Iceland	30			200			
Ireland	50	50	40	350			
Italy	19,000	21,200	5,500	100	1,500	1,790	796
Norway	1,200	500	100		200	300	100
Portugal		100			30	40	30
Sweden	3,000	2,555	1,445				
Trieste	342			30			22
Turkey	1,820	6	40			80	280
U.K.	14,285	10,492	288		675	3,510	495
Bizone	2,050				850		
Total Countries	72,677	79,991	8,903	6,343	4,755	8,506	2,074

Data: Industry Div., ECA

American Machinist INDEX OF METALWORKING PRODUCTION



INDEX	COMPONENTS				
	MACHINERY	ELECTRICAL MFG.	AUTOS, TRUCKS	TRANS-PORTATION EQUIP.	OTHER METAL-WORKING
Nov. 1949 (preliminary) 196	193	197	238	279	130
Oct. 1949 202	194	194	240	288	135
Nov. 1949 224	250	236	223	311	159

AMERICAN MACHINIST'S INDEX OF METALWORKING is based on manhours worked in five segments, which are "weighted" as follows: Machinery, 32.5—Auto & Trucks, 22.6—Electrical Manufacturing, 15.4—Transportation Equipment, 12.4—All Other Metalworking, 17.1. Index figures are a percentage of 1939, which equals 100.

iron castings, business is gaining as more foundrymen use the process.

Good Outlook for Tool, Die Shops

Outlook is good for contract tool and die shops. Sales in October were up 12% from September and this gain continued in November. New business recently has been at the highest mark in 1949. Shipments however have been down somewhat from the 1948 level. Backlogs still are unsatisfactory and are not well distributed throughout the industry. Shops in Connecticut and in the Philadelphia area have profited in particular from recent bookings.

Screw Machine Products Slump

Screw machine products makers are still feeling the severe slump which occurred last summer. Ever since, new orders have been far below comparable months in 1948. Marked improvement is not expected until late winter or possibly the early spring months. One of the greatest headaches of the screw machine products industry is the keen competition from its own customers, who installed screw machine departments during the war and are continuing to operate them.

Mechanical and hydraulic press builders have been doing a fairly good business and inquiries are numerous. Mechanical press production lately has been helped by Ford's orders for its new Buffalo stamping plant. Total bookings for this one plant are said to have totaled $7 million, of which a substantial percentage went to one maker. Other automotive orders of impressive proportions are pending. One automobile company, for example, is planning to pull inside its organization much of the stamping work heretofore done by outside suppliers. This will mean large purchases of presses.

Appliance Demand Persists

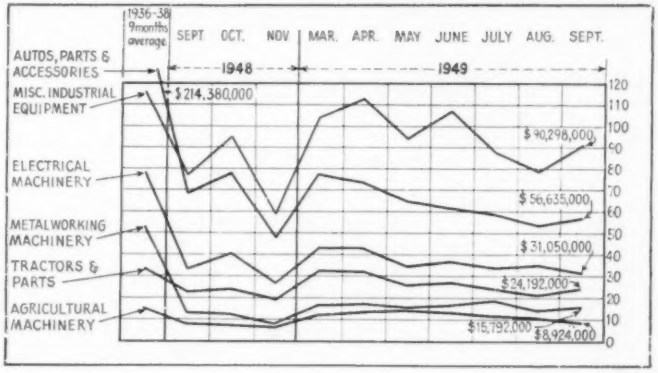
There is no letup in the huge retail demand for household appliances. And manufacturers feel that sales will stay at a very high level for a number of months. Dealers were caught short of refrigerators and electric irons, for instance, at holiday time. Little of this business has been cancelled because of delayed deliveries.

This upsurge in manufacture of appliances has been of great aid to suppliers of parts and materials, including makers of fractional horsepower motors, who are running overtime, in some cases, to catch up.

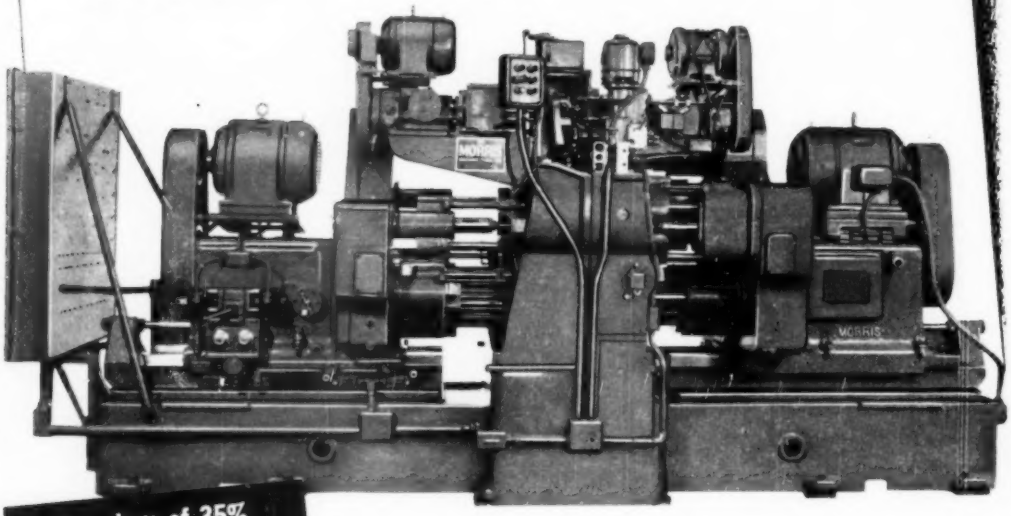
Production of heavy electrical goods shows no signs of sagging. It should hold firm for many weeks ahead.

AMERICAN MACHINIST'S Index for November was off four points from October because of the delayed effects of the shortages growing out of the steel strike.

EXPORTS OF INDUSTRIAL EQUIPMENT INCREASE



"Your Morris Machine replaced 6 old pieces of equipment and paid for itself in 39 weeks"



A savings of 35% on the labor involved on this piece

● This is a typical example of what Morris Mor-speed Production Machines are doing for economy minded production men in hundreds of shops and plants all over the country.

Here are the specs. on this machine: Two way horizontal, eight station, automatic indexing machine. Drills, reams, countersinks, forms radius and taps refrigeration unit cylinders shown at left. Equipped with nineteen drilling spindles, fourteen countersinking spindles, four counterboring spindles, one reaming spindle and eleven tapping spindles. Twenty spindles in left hand head and eighteen in right hand head.

Operations performed on piece shown: Drill, countersink and tap 8,-¼"-28 tap holes . . . drill, ream and chamfer both ends of 1⅛" hole . . . counterbore for ⅝" dia. segment . . . drill countersink and tap, 1,-8-32 tap hole . . . drill, countersink and tap 2,-⅜-24 tap holes, all at each index of machine. Production—150 pieces per hour at 80% efficiency.

● *If your work requires numerous operations on a mass production basis, consult us; our engineers are eager to serve you.*

Builders of MOR-SPEED Line

The MORRIS Machine Tool Co.

CINCINNATI 3, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Take Venture Out of Mothballs

Business executives take delight in pointing out how gullible the American public is in voting for security when there is no such thing as security to be had.

Yet in their own affairs they give a perfect imitation of the voting public. They do not prefer opportunity. They are not willing to take a risk.

The spirit of venture and the hope of profit therefrom have carefully been wrapped in mothballs and stored in the bottom of management's trunk.

This scathing criticism does not emanate from a source hostile to private enterprise. It is the considered judgment of the president of a machinery building company, Jerome A. Raterman, uttered at a recent meeting of the Machinery & Allied Products Institute. His speech is printed on pages 109 and 110.

Mr. Raterman gets at the heart of the matter. What earthly good is a huge pile of cash if one's physical plant equipment is allowed to go to pieces and the old is not replaced by the new?

The ultra-conservatism of which Mr. Raterman spoke is rampant throughout industry. Whoever departs from it is the exception rather than the rule. Suppose we name only one devoted disciple of the cash-in-hand-rather-than-in-machines policy.

A big metalworking company has made lush profits for at least the past two years. How much of these profits has it spent on new production equipment? The answer is, "Practically nothing at all." Its plants are still overflowing with the same high-cost, low-efficiency machines.

It has made handsome earnings while its volume touched the sky and the prices of its products were high. But what about tomorrow, next month, next year, when competition and price get in their licks? It may then be forced into an emergency operation of throwing out the old equipment in favor of the new under far less favorable circumstances than it could do it today.

This company unfortunately is not alone in hoarding the dollars which it should be spending to put itself in a better competitive spot. There are plenty of other managements just like it. Too many, in fact, for the health of the national economy.

What we need is a complete about-face in policy. Industry should take action toward attainment of the goal of "more goods for more people at lower prices." That phrase should represent more than noble words. It should be a battle cry for action—action to slash costs.

One sure means of reducing costs is to increase productivity per man-hour worked. The best way to get that extra productivity is to invest in new machines which are more productive than the old ones replaced.

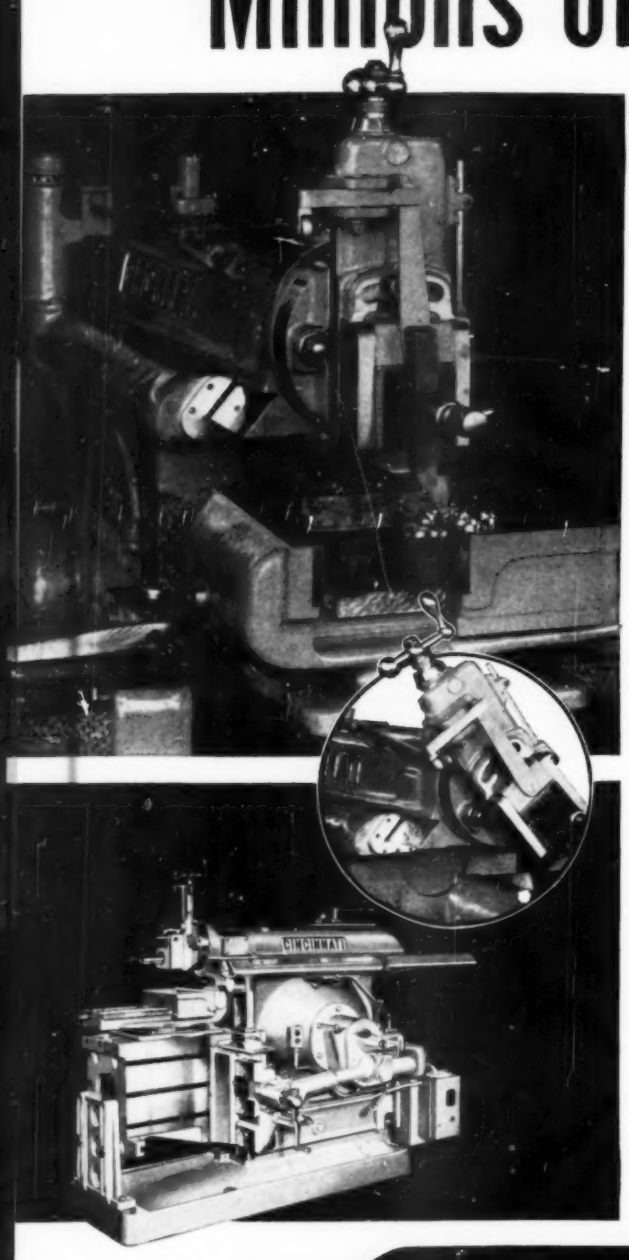
It is time for management to come out from under the security tent and plunk down money for new cost-cutting production equipment. It may seem to be taking a chance. But let's not forget that America's great metalworking industries were not built up to their present impressive and powerful proportions by clinging to a policy of "security first."

Let's give play once again to a spirit of venture. Boldness, not supercaution, should be the order of the day.

Burnham Finney

EDITOR

Millions of cuts . . .



with the NEW CINCINNATI TOOL LIFTER

DURABLE

The Cincinnati Tool Lifter, a new development, operates millions of times without a fault. A successful tool lifter must be certain in action on each stroke to prevent tool damage. It must *continue* to be certain month after month, year after year, for millions of operations. The Cincinnati Tool Lifter, with positive return as well as positive lift, is outstandingly successful.

VERSATILE

Efficient at high speeds or low, long strokes or short—dependable at different positions or angular settings of tool slide—or clapper box, the Cincinnati Tool Lifter is truly versatile and productive.

AUTOMATIC

It relieves operators and greatly increases speed of cutting. After simple setting it is automatic.

SPEEDY

Carbide and high-speed cutting tools both operate to greater advantage when protected by a Cincinnati Tool Lifter.
Write for Catalog N-3.

THE CINCINNATI SHAPER CO.
CINCINNATI 25, OHIO U.S.A.
SHAPERS · SHEARS · BRAKES

ARE WE SLOWPOKES AT MACHINING?

Recent events and reports indicate wider horizons in cutting speeds if we are willing to explore them. Can we afford to rely on cut and try instead of fundamental research and thus throw money away?

BY E. J. TANGERMAN
Managing Editor

STANDARD and accepted surface speeds for machining are apparently nowhere near the optimums. We are seemingly choosing them by cut and try when we could determine them scientifically, according to developments since the war here and abroad, coupled with reports of prewar research in Europe, particularly in Germany. We are on the threshold of astonishing discoveries, if indications are borne out.

Some idea of the potentials has appeared in *American Machinist* in past months, occasionally in major articles if details were releasable, but more frequently in items in "Talking Shop." Thus we have reported advances in coolants and in machine speeds and powers, hinted at the practice, now under development, of determining from the metallurgical makeup and condition of the material just what the optimum machining speed should be, and actually ordering machines and tooling to suit the specification.

In coolants, a competent lubrication expert has told us that the potential advances are as great as those already achieved with carbides. Already we have reported several companies offering combined coolant-lubricants for use in screw machines, and additives (such as Emulphor STH) for water to reduce its corrosiveness so its top potential as a coolant can be realized.

Carbides mounted so the cutting force is compression rather than shear and requiring only simple end dressing of a rotatable preformed shape, new forms of holding to reduce the likelihood of cracking from brazing strains, and even new forms of carbides have tremendously broadened the range in which this material can be used. Comparable developments in other cutting materials, in knowledge of optimum machining angles and in machine power have all helped to expand our horizon. We have also learned much about faster and surer methods of holding the work.

Machining speeds have shown tremendous postwar increases as a result. In grinding, the desired "mile a minute" cutting speeds have been attained even with small-diameter wheels by developing wheelhead speeds up to 200,000 rpm. (This means that even a 0.1-in. loaded mandrel cuts at a mile a minute.) Planer speeds have risen over 50% to 310 fpm, lathe speeds to 1650 fpm in test and 1500 on production units.

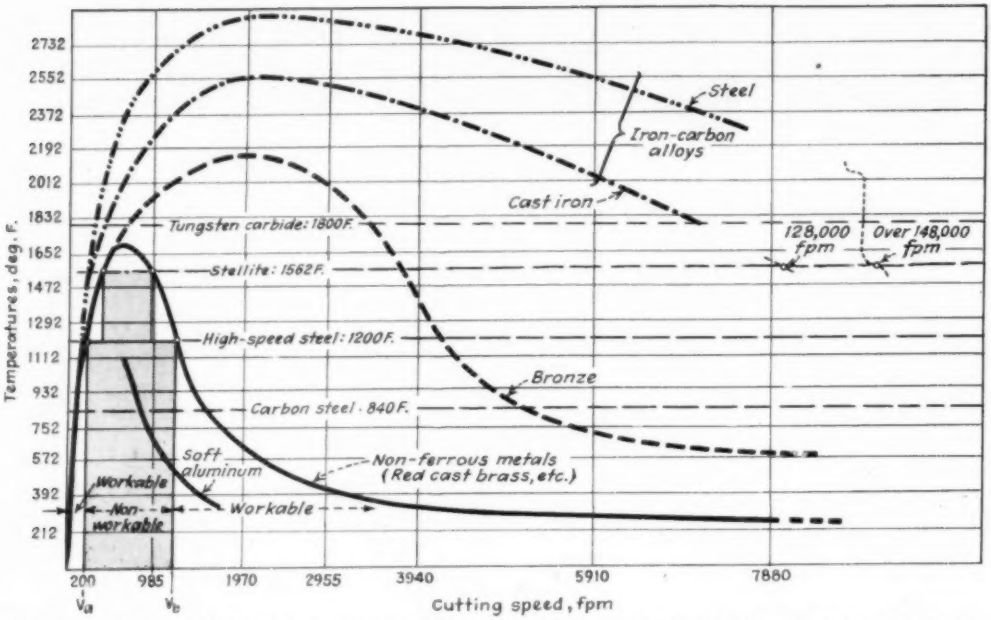
Power Requirements Drop

In attaining the 310-fpm planer speed, William Coomey, general superintendent of Rice Barton Corporation, reports a curious phenomenon. At 180 fpm, his planer was drawing 92 hp; but at 310 fpm, it drew only 55 hp in planing semi-steel castings. This would tend to indicate that the assumption that cutting force is independent of cutting speed is incorrect. There have been occasional other statements that a slight reduction in cutting force is obtained only when cutting speeds are very high. These may be a result of temperature effects of the speed on the workpiece.

Here's another case: In a Midwestern parts plant, the master mechanic found that he could hob steel gears at speeds up to 100 fpm, but between 100 and 200 fpm, chatter, tool breakage and excessive tool wear made machining impossible. He is now having a machine built to operate beyond this "valley of death," where he is sure good hobbing is again possible.

K. V. Olsen and Erik K. Henriksen, the latter now professor in charge of the Department of Materials Processing at Cornell University, ran some turning experiments in Copenhagen in 1948. These showed that there is a *substantial* reduction over a range of speeds from 0 to 300 fpm, and above this—at least up to 750 fpm—the cutting force remains constant. Further, the reduction over the range is not uniform; the curves show a hump in the range of 30 to 80 fpm.

Professor Henriksen feels that the reason these results have not been attained before is that the researchers have not had the combination of a sufficiently sensitive and precise dynamometer with a high-power lathe having a wide range of speeds. He concludes that when cutting with carbides it is always advantageous to take cuts at high speeds, but preferably under such conditions that the cutting force is at a minimum, because it reduces the load on both machine and tool, cutting horse-



Temperatures generated in cutting various metals at various surface speeds were plotted by Salomon in his 1931 patent as shown here (converted to English measure). Cast red brass, for example, is unmachinable with HSS at surface speeds between 200 and 1100 fpm, with Stellite at speeds from 300 to 975 fpm, according to Dr. Salomon's original curves. Dashed lines are estimated only; further research is needed to establish accurate data

power consumption and increasing production capacity. He feels that an increase above the speed (300 fpm in the particular experiments) at which minimum cutting force is obtained results only in shortened tool life without compensating advantages. Further, speed should always be set above the critical range where the hump occurs in the curve if tool life is to be increased. Additional experimental and other evidence is coming up to support and clarify this statement.

A point of view somewhat different than Professor Henriksen's is held by Dr. Max Kronenberg, consulting engineer of Cincinnati. He believes the trend in machine tools is towards higher horsepower, which will be utilized by attaining higher cutting speeds with smaller areas of cut, hence lower forces, rather than by the opposite combination. He points out that lower forces will reduce deflections of machines and workpieces and higher speeds improve surface quality, and feels that this trend began with the advent of the cutting carbides. This opinion is borne out by the tests made by Mr. Coomey, indicating that cutting force may drop at relatively high cutting speeds—way above 250 fpm, depending upon material, depth of cut and other factors.

In 1931, a German patent was issued on methods of machining metals involving so-called "super-critical speeds." The inventor, C. Salomon, made tests on non-ferrous metals such as aluminum, copper and bronze. The tests on aluminum (93 Br, 40° Scleroscope, 20,000-psi tensile strength) were run at three speeds, 1450, 7000 and 55,000 fpm, with helical milling cutters of 8 or 20 teeth and various feed rates. Horsepower consumption varied between 6.16 and 17.6 hp. On copper, a speed of 9350 fpm was attained, and on bronze 5300 fpm. As a result, he claimed that "the method is characterized by the selection of cutting speeds in excess of 2000 to 2500 fpm and avoiding cutting speeds within the limits v_a and v_b which are critical for both the work and the tool material, whereby a cutting motion is executed by the tool."

The patent is based on curves of cutting speed plotted against temperature, shown here, indicating that, for any given set of conditions, the heat generated by cutting follows a "hump" curve. The limits of v_a and v_b bridge the top of this hump, where heat generated is greatest. The patent was important enough that Krupp bought it.

"Valley of Death" Again

If these curves are correct, Dr. Kronenberg points out that the heat generated at a very low speed and at a very high one may be the same, so that a tool capable of withstanding limited heat might presumably be used at very low or very high speeds, but not at speeds in between. If this hypothesis is correct, extremely high cutting speeds might permit the use of carbon-steel tools again. This is borne out by General Motors experience during World War II, when in milling SAE 4140 forgings at 1285 fpm and very high feeds, it was found that neither work nor tool heated excessively. It must, however, be borne in mind that

even if the cutting temperature remains the same, the higher speed may be expected to be accompanied by a higher rate of wear, simply on account of the abrasiveness of the material.

Dr. Kronenberg further reports that high-speed tests were made abroad during the war with a fly-cutter at 12,000 rpm, and in machining cast iron at 22,000 rpm. Similar tests may have been run in Russia, and we achieved 19,000 fpm in milling aluminum and 2600 fpm in milling steel during the war. Much higher milling speeds on steel are in the offing.

In some tests of his own on SAE 1045 last year, Dr. Kronenberg used 1600 fpm and 900 fpm on a heavy, rigid 35-hp machine with well-backed tools. Tool life at 1600 fpm was not as high as at 900 fpm, leading Dr. Kronenberg to the conclusion that he was still on the ascending branch of the Krupp curve.

It should be quite obvious from these reports that our knowledge of machining speeds and feeds is sadly lacking. Many years have elapsed since publication of Dr. Kronenberg's basic book (1927) on metal-cutting investigations carried out in the United States and abroad and providing data for charts and formulas for ready shop use. These data have been republished on pages 324-330 and 344-355 of the new "Handbook for Tool Engineers" (McGraw-Hill Book Co.), but do not include recent materials. We seem rather to be falling back to cut-and-try methods for determining optimum conditions, which F. W. Taylor was trying to eliminate as far back as the turn of the century.

Optimum-speed Forecasting

One manufacturer, at least, is hard at work on this problem. He has come to the conclusion that great variation exists in cutting speeds, tool position, and the like as the result of changes in instantaneous diameter of a piece turned, for example. He further believes that shank and design of backing material for carbides must be investigated, for example, as well as design of machine tools and fixtures. He is attacking the problem from the standpoint of analyzing a material to determine its chemical makeup and its physical structure. Once these are classified, he hopes to be able to provide tables or charts which will permit ready selection of optimum machining speeds.

In any case, it is obvious that research must be undertaken on tool angles, support, cutting speeds and feeds, coolants and similar factors if optimum cutting conditions are to be reached. In one case, for example, Dr. Kronenberg reports a ratio of 1 to 7½ between the lowest and the highest tool consumption on the same job—and the workpieces showed no substantial differences in microstructure. Two broad programs are indicated, one on optimum speeds and feeds for present materials and equipment, the other exploring the super-speed range entered by the Salomon tests. One is immediately applicable; the other will provide the speeds and feeds we may be using tomorrow.

There is more to this than machining economy. With such knowledge, we can order machines and tooling to do a job with maximum efficiency—and at an assured minimum cost. In addition to the immediate advantages of such knowledge, there is the war potential, when tools and machines are always at a premium. Then we *must* have efficiency if we are to retain our freedom.

Tips FOR TOP SHOP MEN

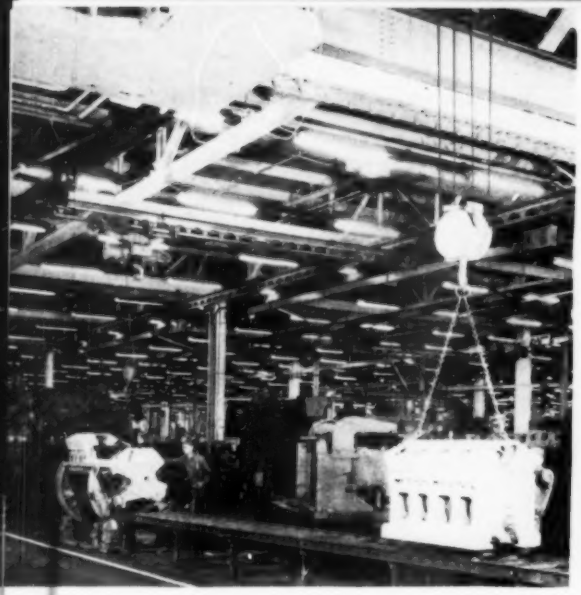
309 Wisdom cannot be acquired wholesale. You can't swallow it in gobs; you must nibble at it. Hence the frequent statement that only the old are wise. They may not be, but they've had the best chance.

310 An old country saying is "Them that can brag *without lying*—let 'em brag." Remember the "lying" part particularly.

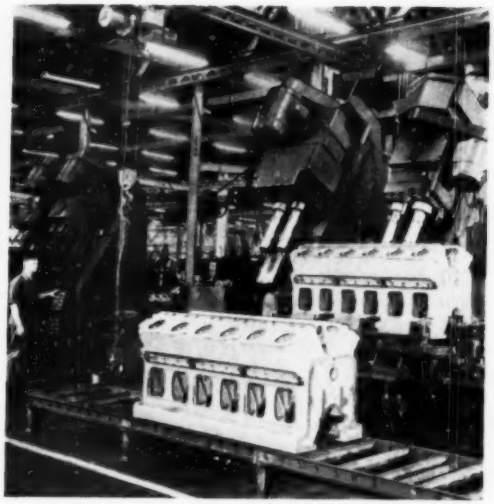
311 Expect men to have complaints. It's human nature, and besides, reforms come only from below. No man with four aces yells for a new deal.

312 Remember, it isn't your *position*, but your *disposition*, that makes you happy or unhappy. If you find fault with others continually, remember that the man who hasn't a fault, hasn't a friend. ,

NOTICED YOU HAD AN INTERESTIN' PROBLEM, SO-I THOUGHT I'D GIVE IT A WHIRL BEFORE YOU GOT HERE THIS MORNIN'. I THOUGHT I'D LIKE FIGGERIN' BUT COULDN'T SEE ANY FUTURE IN IT— HOPE YOU DON'T MIND THE TOWEL. COULD NOT FIND ANY OTHER PAPER. BE GLAD TO KNOW HOW IT COMES OUT, LET ME KNOW. WILL YOU?
THE OLD COOT IS ONE OF THOSE GUYS YOU READ ABOUT. MATH IS SO EASY FOR HIM HE WON'T TAKE A FIVE FIGURE SALARY AND A SWANKY DESK. HE MAKES MORE MONEY THAN WE DO—THE BOSS USES HIM TO DOUBLE-CHECK ALL OUR ANSWERS.
"ONE NEVER KNOWS, DOES ONE."



Start of machining line for V-8 and V-12 engine-block castings is placed so overhead crane in parts storage bay loads castings onto roller conveyor for delivery to turnover fixture. Operator of first milling machine lifts casting from fixture with overhead electric hoist controlled from pendant pushbutton station in convenient location



Standard roller conveyors move castings from machine to machine down the line. Overhead tramrail hoists lift castings to and from individual machines. At end of line, machined casting moves to inspection area

MECHANIZED HANDLING EASES ENGINE

Caterpillar Tractor Co. moves 457,000 lb per day in new diesel engine factory.

Planning permits application of mass-production principles to units ordered on job-lot basis

BY LLOYD J. ELY, Factory Manager
Diesel Engine Factory,
CATERPILLAR TRACTOR CO.

LOW-COST operation is assured at the new engine plant recently put into production by Caterpillar Tractor Co. Of major importance is a layout planned for continuous flow of work, and modern handling equipment that provides efficient movement of heavy parts and assemblies both between machines and departments and at individual work areas throughout the building. Effective handling in turn permits close production scheduling and full utilization of carefully tooled production equipment.

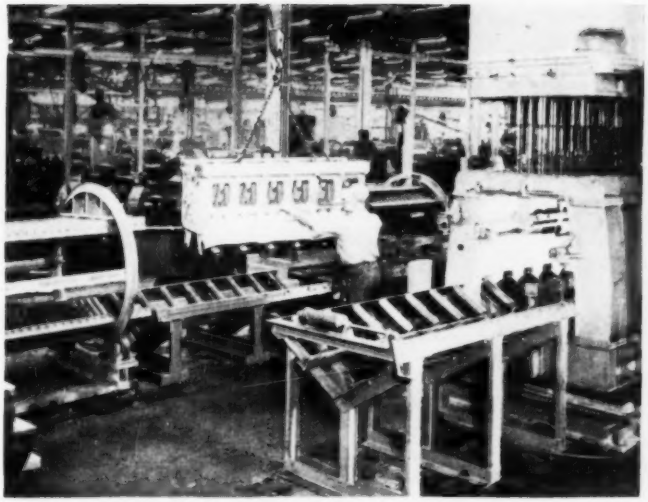
Now being made in the new factory are all diesel engines for "Caterpillar" track - type and wheel-type tractors and motor graders, and those engines marketed as industrial power units, marine engines, and electric sets. Under present schedules this means that approximately 4800 tons of material are handled every month. All must be moved according to a predetermined schedule to insure continuous production in other parts of the plant.

Carrying this volume are more than four miles of conveyors, 1400 hoists and cranes with capacity up to 15 ton, industrial trucks, and an industrial railroad system. Included in the conveyor equipment are more than 22,000 ft of gravity roller conveyor and four floor-type continuously moving steel slat conveyors in the engine assembly departments. A fifth power slat conveyor moves finished tractor engines from test to radiator-and-fan-mounting areas.

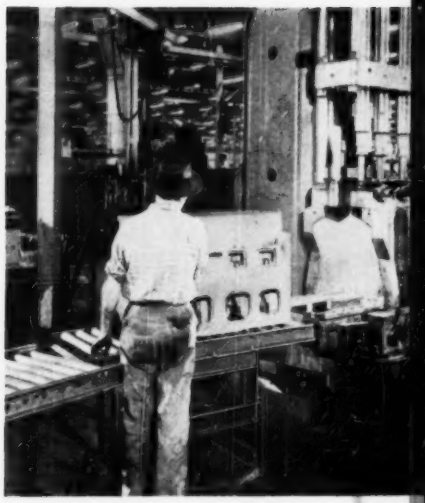
The industrial railroad system moves castings and forgings from outside yard storage to a 100x900-ft bay along one side of the machine shop. Material then feeds down 30 machining lines to an inspection area on the opposite side of the machine shop. Circling the machining area, the plant railroad then moves finished work either to assembly parts storage or directly to the lines.

19 Models On Same Line

The assembly area consists of three assembly lines for basic engines; two for erection, testing, painting, and shipping of industrial engines; a large test room and



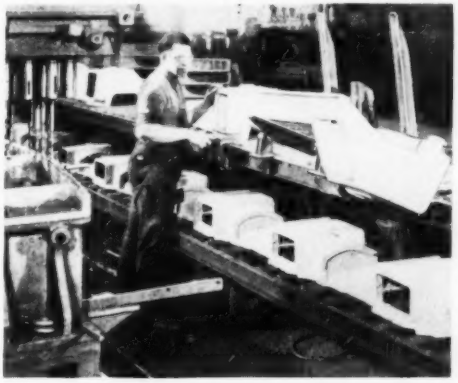
Power-operated turnover fixtures position castings for transfer by hoist to large Natco multiple-spindle drillpress. Conveyor in foreground is built in as part of drill fixture so heavy casting easily can be handled by operator of machine. Drilling machine has 105 spindles and is tallest machine of this type



Conveyorized turntables in machining line for small engine blocks permit operators to turn castings end for end. Machine fixture has conveyor section for easy movement of castings into and out of clamping position. Many fixtures are similarly equipped

MANUFACTURE

space for storage of both purchased and machine shop finished parts. Illustrating the ingenuity that went into the layout is the fact that one man may work on 19 different engine models moving along the assembly conveyor. All three basic lines deliver finished engines to a cross bay. Here a bridge crane transfers them to four roller conveyors along which they are moved by drag chain into a carefully planned test room.



Oil-pan turnover fixture is powered with Hanna Air-Draulic cylinder mounted under conveyor line. Conveniently located control valve permits operator to shift casting from conveyor with little effort. Lower conveyor moves different size of pan along machining line

Along two sides of this room are located 21 test cells, each large enough to accommodate two engines. Each bank of cells is serviced by a bridge crane to install engines from the conveyors and to remove them to the out-going conveyor or to one of the two adjustment floors. There, fixtures and gantry cranes have been provided to expedite minor adjustment operations.

Engines for "Caterpillar" tractors or motor graders are moved on a floor-type, continuously moving, steel slat conveyor to an assembly area where radiators and fans are mounted. Other engines for industrial-power, marine, and electric-set applications are moved by crane to a storage area, then by overhead cranes to assembly lines where attachments are added as specified by customers. Units next go to a final test floor, where the attachments are checked, then to a spray paint line for final finishing prior to crating and shipment.

High material-handling efficiency has been accomplished because production planning has made it possible to group orders for similar engines according to monthly load estimates. This permits the application of mass-production principles to machining and assembly of engines ordered and scheduled on a job-lot basis.

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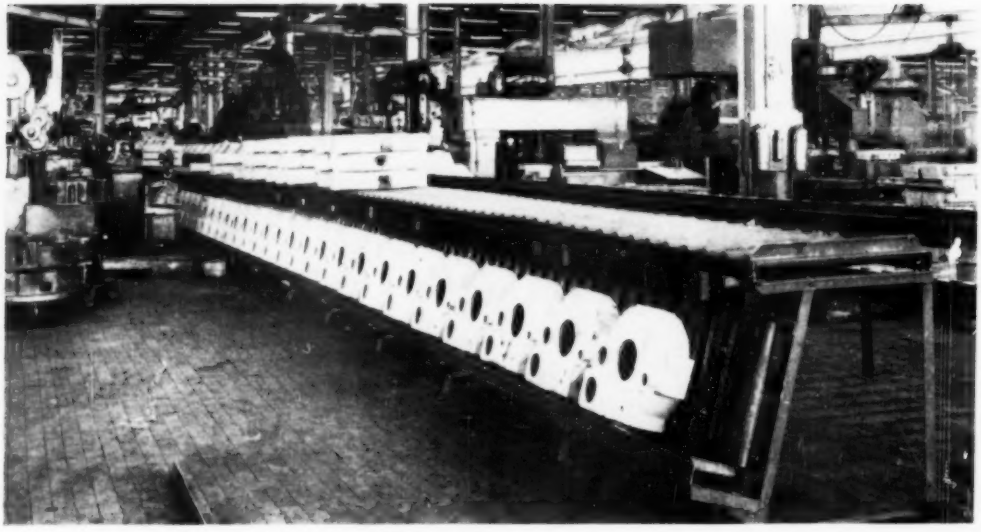
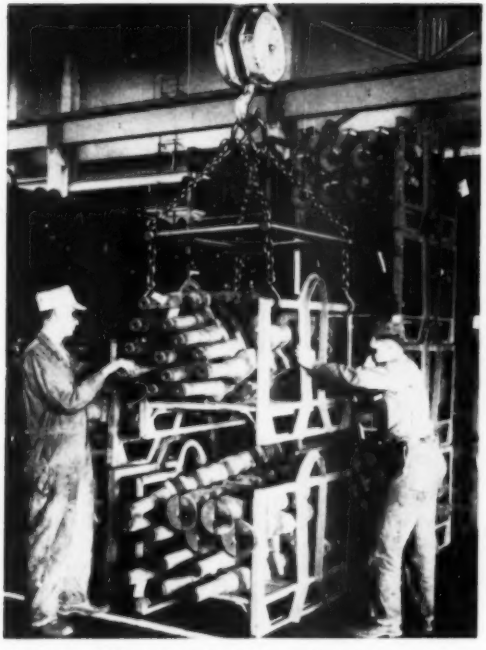
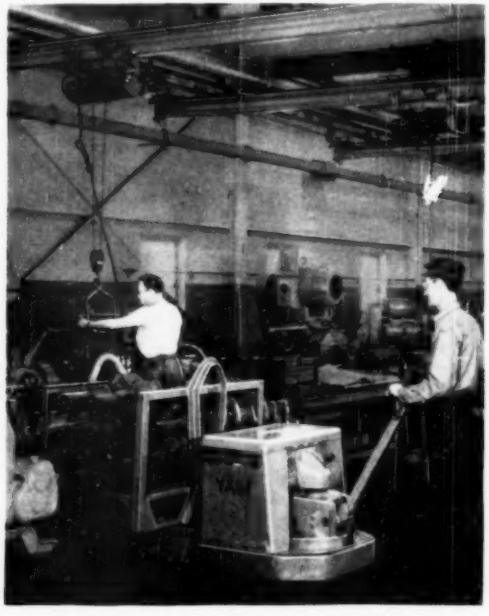


Combined conveyors hold parts in most convenient position for operators along machining line. Cast bell housings are supported on tilted roller conveyors and oil-pan castings move along horizontal sections. Rough castings, loaded at this station, move down line toward final inspection area



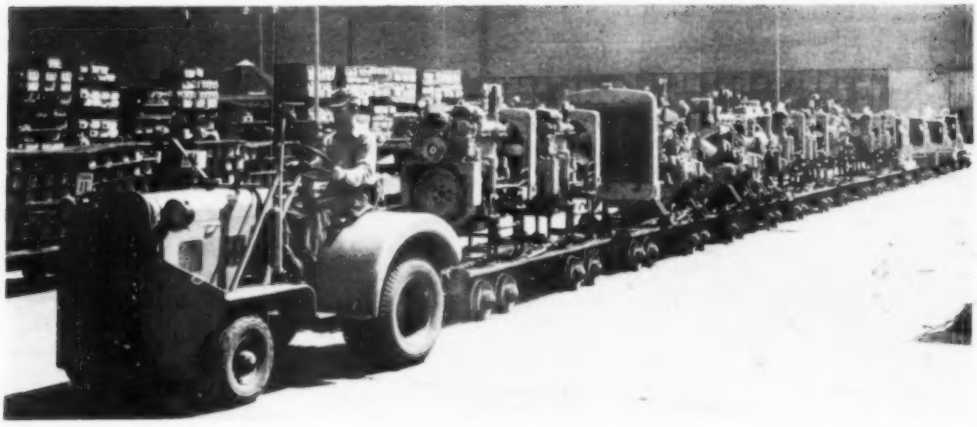
Special welded steel racks hold crankshafts for stacking in storage area and for easy handling with lift trucks or cranes. Overhead crane in rough storage bay delivers forging to floor conveyor for machining operations



Power lift truck delivers parts to first operation in separate line of general-purpose machine tools for machining large and special-order crankshafts for "Caterpillar" diesel engines. Parts are handled from station to station by overhead hoists that move on bridge units and are operated from floor. Extreme flexibility is thus obtained

Curved conveyors carrying cylinder liners from turning and facing lathes circle four-spindle special boring machines to deliver parts in convenient position for loading parts in machines. Bored liners then move on slat conveyor in foreground to induction heat-treating machines

Transfer carriages permit easy movement of crankshaft racks from heavy-duty, floor-mounted roller conveyor lines to or from short conveyor holder stations at each machine. Racks are designed so each level can be removed to uncover cranks in lower levels



Industrial railroad cars are pulled through factory with four-wheel rubber-tired gasoline or diesel tractors. Tractor can spot train of cars, then move to another location without having to switch to other tracks for passing

Two-level roller conveyor lines permit building up bank of cylinder liners ahead of heat-treating. Each level of storage conveyor has four sections for segregating different size liners as they are transferred from slat conveyor that moves them from boring operation

ANGLE MOLDING PRESSES PROVIDE FLEXIBILITY IN PLASTICS PRODUCTION

AN ANGLE TRANSFER PRESS for plastic molding has two horizontal cylinders located on the side of the press. The press itself can be a standard, semi-automatic compression-molding unit with a few minor changes in construction required to accommodate the side cylinders.

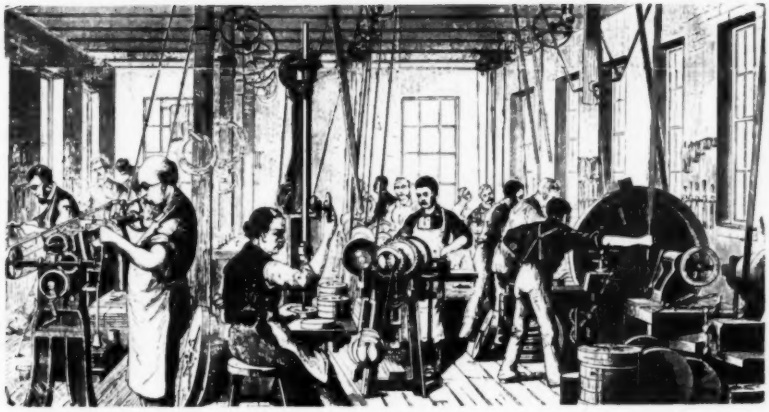
These side cylinders are double-acting, and can be raised or lowered to suit the mold size. They are guided by the four vertical strain rods of the press through bronze bushings, and are tied together by two horizontal pre-stressed strain rods. The cylinders can be added to almost any kind of four-column press.

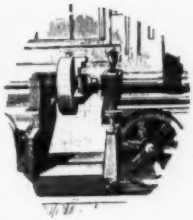
Selector switches on the combined press allow straight compression molding or angle transfer molding. Switched to compression molding, the press controls cut out a holding pump from the main cylinder and cuts out a large pump from the side cylinders. The built-in breather cycle can also be eliminated.

As a transfer press, the machine uses the large pump, which operates the side cylinders, and the small pump, which maintains pressure in the main cylinder during curing.

Special molds are not necessary for the angle press. With universal sets, the regular molds can be gated so one can be cut out in case of failure and the other three, if it is a four-mold setup, can be employed as usual. With universal molds and transfer pots, all parts are interchangeable and two transfer pots can be utilized for any number of molds.

Injection-molding experiments in an angle-transfer press with thermosetting materials are being carried on, and the results so far are encouraging. It is believed that the flexibility and economy of the angle-type press make it worth while in any molding plant. Higher initial cost is usually saved in the first tooling. Mold standards can be set up to insure dependable and maximum production, even on small runs.—J. W. Tomka, Elmes Engrg. Works, American Steel Foundries, at S.P.I. meeting.





MACHINE TOOLS were crude, but machinists were real craftsmen in this early plant of E. Horton & Son Co. at Windsor Locks, Conn.

Those Connecticut Yankees Again

Like many another tool indispensable to modern production, the lathe chuck had its beginning in that cradle of American Industry, the Connecticut Valley

BY PAUL E. DILLBERG*

HOLDING and driving an object in rotary motion has always been a problem. The ancient seal-cylinders of Mesopotamia betray the use of a lathe. But how those heavy stones were held and turned to form their perfect symmetry, history fails to tell. Undoubtedly, the men of Bysmia solved the problem in much the same way as the early Connecticut Yankee.

Between parallel hills in the Connecticut valley of the Willimantic River lies the village of Stafford. Once an Indian spa, the unimproved land was soon sold to prospective settlers for six shillings an acre. The funds from this sale moved the Collegiate School of America from Saybrook to New Haven, where it was shortly renamed Yale University.

Harvesting and grinding of grain brought a moderate living to the valley until, one day, Israel Bessel rode down from Massachusetts. His startling tidings of the Battle of Lexington moved the settlers hurriedly into the valley. Hands that had broken the soil now turned to new pursuits. Bog iron was plowed and scraped from the hollows. Blast furnaces sprang up along the river to feed cannon shot into the colonial till. A great manufacturing movement began and Stafford spread rapidly north and south along the valley.

In a hollow north of Stafford, where the river narrowed, Howe and Converse built a small machine shop. Power gears, pulleys and textile rolls were made and sent throughout New England. It was in this machine shop that a skilled loom repairman invented an ingenious holding device. On July 18, 1834, Simon Fairman received his patent letter for an "Expanding and Contracting Universal Chuck for Lathes" signed by Pres. Andrew Jackson.

Six years later Fairman left Howe and Converse and built his own little shop in West Stafford. The Diamondville Works flourished and machines of many descriptions were made.

Fairman soon attracted several young men from the surrounding valley as employees in his workshop. Two of these not only became first-class mechanics but also sons-in-law. J. R. Washburn married Adelaide Fairman, and A. F. Cushman married Harriet.

With the shop in good family hands, Fairman left Stafford for Watertown, N. Y., where he earnestly tackled the selling end of his business. Loading a wagon with his chucks, he drove through the countryside stopping at every shop along his route. Leaving samples, he would pick up his chucks or his payment on his return trip.

Left in charge when Fairman moved, John Washburn greatly widened the scope of the chuck business. Through friends, he introduced the lever chuck to Europe, and production demands taxed the small plant to its limit (Europe probably didn't manufacture its own lathe chuck until about 1896, when the Scandinavian Works, Inc., began production in Tyringe, Sweden).

Together with a former Howe

*Vice-chairman, Editorial Committee, Hartford Chapter No. 7, ASTE.

and Converse employee who had recently joined the Diamondville organization, Washburn made several improvements in design. The front plate containing the jaw slots was now fastened to the lathe spindle by bolts instead of the large nut Fairman had used. Also the first reversible jaw was designed, giving a new versatility to the chuck.

Horton and Whiton

The first employee to break away and establish a factory exclusively for manufacturing lathe chucks was Eli Horton. Having worked closely with Washburn on many important improvements, Horton foresaw the demand for a larger producer in the field. In 1851 he obtained his first patent and moved from Stafford to Windsor Locks, Conn., where he began making his universal chuck. The radial jaws moved on a circular gear ring which was connected to a series of pinion screws at the chuck's outer diameter. When a wrench was applied to any one of these screws, the jaws all moved concentrically to or from the center.

Back in Stafford, about five years after Eli Horton left, a neighbor of John Washburn became interested in the business. Seeing the possibilities of the chuck, David Whiton soon became an active partner and, selling his waterwheel business, threw all his energy behind the Diamondville shop. However, it was not long before the increase in foreign orders made shipping a major problem, so David Whiton and his son Lucius took their share of the Stafford plant and moved it to New London. Here the new branch of the chuck business grew until the D. E. Whiton Machine Co. was founded, and along with the lathe chuck several other machine lines were added. Upon David Whiton's retirement, his son Lucius became the active head of the organization. New buildings were built and the Whiton gear-cutting machine became recognized as one of the best on the market. In 1947 the company was purchased by a former Cushman executive, and still manufactures machines and chucks.

Cushman Enters the Field

Diamondville lost another employee in 1862 when Austin Cushman moved to Hartford. Here on Spring and Church streets he started a one-room chuck factory. Powered by treadles, his crude machinery turned out a new self-centering chuck that gained a quick market. The jaws were operated through a gear rack and several pinion screws and the chuck was described with great enthusiasm in the first issue of the *American Machinist*. Occasionally, after loading his chucks on the river boat, Cushman would follow them to their destination, incorporating a sales trip with his delivery. From this beginning, Cushman has grown rapidly to its present position.

Still growing fast, the training ground for the industry now switched from Stafford to Windsor Locks where Eli Horton was making a variety of two-, three- and four-jaw chucks. On the death of Eli's son, J. H. Sweetland was appointed superintendent. However, a few years later he left Windsor Locks for New Haven, where he interested Hoggson & Pettis Co. in the manufacture of chucks. The company, however, discontinued this part of their business in later years. With Sweetland's resignation, James E. Skinner was named superintendent.

Horton earned an international reputation with its excellent chucks, receiving awards at industrial expositions in Vienna, Melbourne, Liege and Paris, as well as from many American cities.

Westcott Chuck

News of another chuck improvement and a new chuck company now reached Connecticut. When Simon Fairman moved from Stafford to Watertown, N. Y., he perpetuated his former Diamondville venture. Under his influence a Westcott Chuck Co. was founded at Oneida, N. Y. Combining the two most popular designs, Westcott manufactured the first combination type chuck. By inserting a spiral screw between each radial jaw and the gear ring it was possible to adjust any jaw independently, to grip irregular or eccentric shapes. Once adjusted, all jaws could be moved in that same relationship by use of the gear ring.

In 1878, Eli Horton died, leaving his business to his son-in-law, Ezra Bailey, who carried on the development of the product until his retirement in 1912. The outbreak of World War I found Horton's grandson Sidney at the company's head, and today, E. Horton & Son, the oldest name in the lathe chuck industry, still maintains its reputation for its line of holding devices.

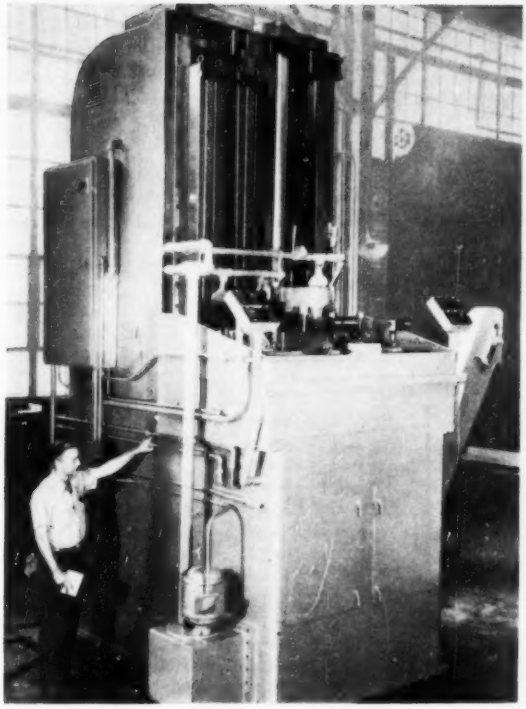
Union Manufacturing

In 1880, James E. Skinner resigned and left Windsor Locks for New Britain, where he interested the Union Manufacturing Co. in the possibilities of the chuck. With an established gray-iron foundry already, the chuck served to augment the business, and under Skinner's direction this addition contributed greatly to the company's success. Soon the general hardware, household pumps and carpenter's planes were crowded out of the plant. Several capable men had been groomed in the chuck division, so seven years later, when James Skinner left the Union Manufacturing Co., its entire plant was concentrated solely on gray iron castings and its extensive line of lathe chucks. The company's growth from a small beginning in 1866 to its present position attests to its success.

Skinner Chuck

Together with a company stockholder named Camp, James Skinner founded the Skinner Chuck Co. in 1887. Located only a few steps from the Union Manufacturing Co. in New Britain, this new company augmented its regular line with a pneumatic chuck. Under the subsequent leadership of Skinner's son, Edward, and Camp's son-in-law, Rogers, the Skinner Chuck Co. has reached its present enviable position in the field.

The ability of the Connecticut Yankee to cope with the ever-changing industrial world is well demonstrated by these companies. The E. Horton & Son Co., Windsor Locks; Whiton Machine Co., New London; Cushman Chuck Co., Hartford; Union Manufacturing Co. and Skinner Chuck Co., New Britain; and the Westcott Chuck Co., Oneida, N. Y., are all Yankee industries whose foundations were built in Connecticut in 1834.



Welded steel construction insures rigidity, saves weight and reduces manufacturing cost. Main column, right, has uniform wall thickness, is easier to machine and finish than a casting

Welded Construction Cuts Broach Cost

BY J. A. SMITHERS, Welding Engineer
THE LINCOLN ELECTRIC CO.

LARGEST broaching machine ever built by American Broach & Machine Co., is a 40-ton vertical surface broach for machining diesel locomotive parts. Feature of the machine is its all-welded construction.

Welding of the column and table was performed by Valley Welding and Boiler Co., Bay City, Mich. Over-all height is 15½ ft, gross weight more than 33 tons, and stroke is 72 in.

Although a weldment was planned primarily because of the delivery time, other savings were an estimated $2000 for pattern costs, elimination of one week's time for snagging and filling, and saving of 6000 lb.

The main uprights were the most critical parts. The two outside members are 6x8⅝ in., and the center member 6x14 in. In such critical members, it is important that there be no core shifts to produce web thicknesses below or above specifications. When such conditions occur it is impossible to control rigidity of the frame, a prime requisite in broaching equipment if metal is to be removed at the rates and with the quality of finish that make broaching economical.

With welded construction, the thickness and quality of the steel is uniform and there is less material to remove, hence less machining time. Tool life during planing operations is also substantially increased.

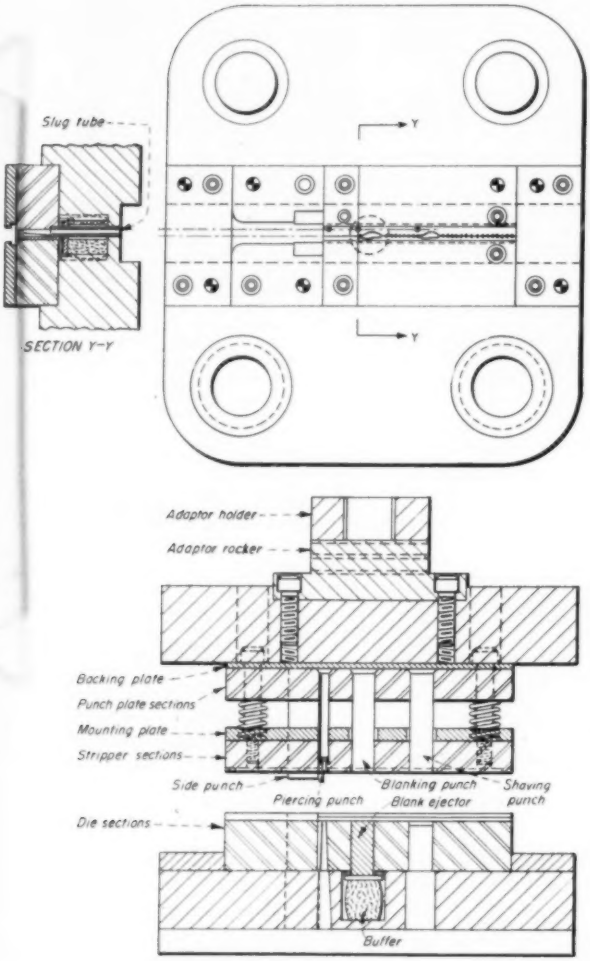
COMPARATIVE COST OF CASTING AND WELDING

WELDMENT		CASTING	
Weight (main column)	21,000 lb	Weight (main column)	27,000 lb
Cost per lb (including stress relieving)	$0.1428	Cost per lb	$0.1375 to 0.1400
Total cost	$3000	Pattern cost	$2000
		Total cost (Based on $0.14 per lb)	$5780

Note: Casting costs are estimated on basis of past experience.

MODERN GRINDING METHODS PRODUCE PROGRESSIVE SHAVING DIE

A second handling for shaving is avoided by making a die that pushes the blank back into the strip, then literally reblanks the piece at the shaving station



Modern diemaking techniques and equipment make it possible to produce a progressive blanking and shaving die. Components are produced accurately and economically by a combination of jig boring, jig grinding and Diaform grinding

BY H. S. HALLEWELL Managing Director, TOOLMASTERS LTD.

Shaving in progressive dies is not recommended by J. R. Paquin (AM—August 11, 1949, p102) for two reasons:

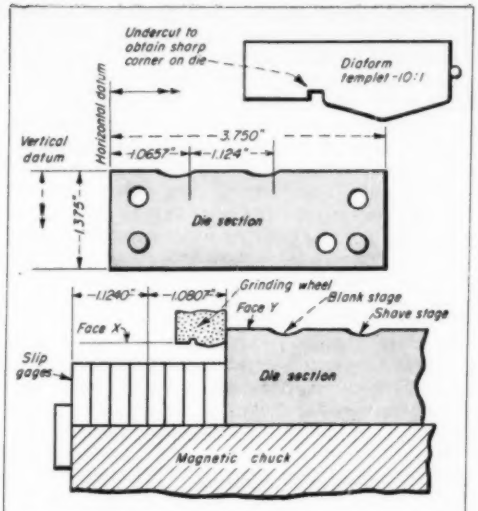
First . . . "The clearance between holes in the strip and diameters of locating pilots render accurate part location improbable."

Second . . . "As a rule progressive dies run at too great a speed for successful shaving operations."

TO SUPPLEMENT Mr. Paquin's effective outline of the principles of shaving, I should like to discuss one method that *is practical* to use in shaving small blanks in progressive dies. A well-made progressive tool will operate successfully with 0.0005-in. clearance on the pilots. The tool shown is simple, but the piece part it produces is held to the above maximum tolerance on the profile. Hence, even though the ideal speed for shaving is much lower than for blanking, there is no reason why a progressive die should not be used on that account. Generally speaking, output is governed by the slowest operation. In this case, then, it is practical to run a progressive die at shaving speed to avoid a second operation.

The main trouble experienced with progressive dies for shaving is fouling by wire-like chips and slivers produced by the shaving operation. This trouble usually causes progressive dies to be abandoned in favor of the simple, clean and proved methods outlined by Mr. Paquin. But fouling trouble can be avoided by a method which we employ successfully for small, intricate, close-limit work—where incidentally most shaving dies are used.

The method suggested returns the blank to the strip, and accurately moves it to the shaving position, where it is literally reblanked from the strip. By this method the shaving remains in an unbroken ring in the strip; it does not fall out and foul up the tool. There is little danger of shavings getting on the face of punch or die and damaging the surface of the component.



Identical positioning of openings in corresponding die, punch plate and stripper sections is accomplished by Diaform grinding. Holes in the pieces are jig bored, then jig-ground if required. Next, the sections are set up on a magnetic chuck and position of the openings is established with slip gages. The wheel is dressed by the Diaform attachment using the 10:1 templet for control. Procedure for grinding is:

1. Dress the wheel for the blanking form, using the 10:1 templet, a 0.200-in. tracer and a 0.005-in. radius diamond dresser.
2. Set die section against two sets of slip gages and touch wheel to datum face of section.
3. Remove 1.0807-in. set of slip gages, move die up to other set and form grind the blanking stage. Correct depth is established when face *X* of wheel touches face *Y* of die.
4. Redress wheel for shaving form. This involves changing to a 0.100-in. radius tracer.
5. Set up punch-plate and stripper-plate details, and form-grind the blanking stage to shaving size.
6. Remove 1.240-in. slip gages, set all three details against the remaining set and grind shaving stage

Location is accurate. Therefore, the shave is even and consistent over long periods. Finish is equal to that obtained by well-located, second-operation tools, and superior to that obtained by the cut-and-carry methods usually employed.

Shaving of pierced holes is equally successful if treated in the same manner, because the shaving and slug are removed as one. Wire-like shavings resulting from normal re-piece practice are avoided. Normally, these shavings pull back and foul up the tool, and account for more tool downtime than anything else. But it is rare that the common trouble of returning slugs prevalent in straight-forward piercing tools occurs with this method.

Component Material

Almost any metal up to 3/32-in. thickness that can be successfully blanked can be satisfactorily shaved in progressive tools. Up to this thickness only one shaving operation is usually necessary.

Poorest materials for shaving are probably straight carbon steels of the water-hardening variety. These tend to drag and give a poorer surface than other materials. Anyone obtaining poor results in shaving this material should not be deterred from trying it elsewhere. One experience we had in trying to shave a small intricate cam of this material was most disappointing, and in attempting to obtain good results the following materials were tried in the same tool:

Brass, copper, spring bronze, hard and soft mild steel, all shaved perfectly. Stainless steel was tried and a very high quality finish was obtained. But we have always failed to get a comparable finish in carbon steel even after burnishing.

The main points governing the success or failure of progressive dies are those that apply to any other press tool to provide accurate components. These are design, accurate manufacture, good tool steel, (or, if needs be, carbide), and careful and clean operating conditions.

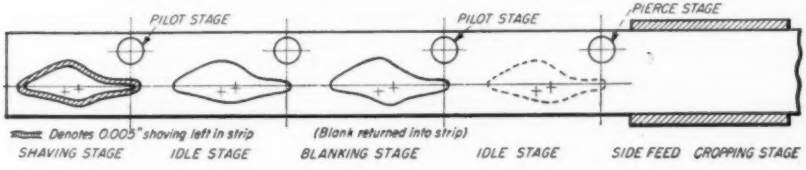
Design of Progressive Dies

As the method to be adopted is that of returning the blank and/or the piercing to the strip, this entails the use of a controlled spring- or rubber-loaded stripper for the punches and similar ejectors in the die. The feed should be controlled by side cutters with additional piercing punches and pilots for correction. If necessary, the piercing punches and pilots should be tungsten carbide.

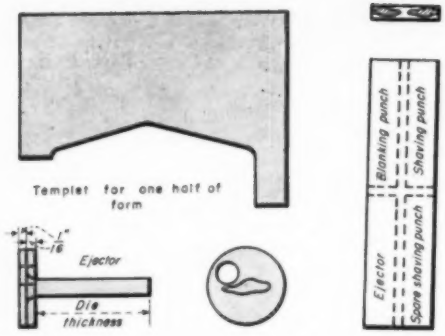
Although only one or two portions of the blank contour require shaving, it is necessary to shave the whole blank with this method. Therefore, the method is limited to comparatively small work.

The tool must be designed in a manner that facilitates easy and accurate manufacture. To achieve this the die should be built up in sections and carefully ground all over. All holes, including dowel holes, should be jig-ground, if possible, and all profiles form-ground.

It is usually possible to section the stripper and punch plate in the same manner as the die. In fact, it is a very great aid to ultimate accuracy if these



Scrap strip layout for progressive blanking and shaving. The blank is returned to the strip and reblanked from the strip at the shaving station.



Two templets (one shown) are used for dressing the wheel to grind the blank ejector, blanking punch and shaving punch. Tracer styluses are selected to dress the wheel properly for grinding the blanking and shaving punches to desired sizes. These details are worked out of a single piece of stock

sections are all identical; that is, split in the same positions as the die. This construction is usually convenient for the punch plate, but not for the stripper. With a little thought, however, and usually by increasing the sizes of the die and punch plate, it is possible to build up the stripper in the same way with sufficient width to use tie pieces. This is to facilitate accurate surface grinding.

Whole aim of the design should be to permit easy grinding of everything. With increased availability of precision grinding equipment to aid the tool and die maker, the finishing of tool steels in the soft state is becoming unnecessary and undesirable in high-performance tools. Whatever tool steels are selected, a certain amount of distortion in heat-treatment is almost certain. The best-quality high-carbon, high-chromium steel, or high-speed steel if preferred, should be used for the punches and dies, and cheaper oil-hardening steel for the punch plate and stripper. Cost of the steel is relatively unimportant. Use of cast steel instead of machine steel for punch plate and stripper plate, even if to run soft, is much better for grinding, and the material is not so easily damaged or bruised in service.

When drawing the punches, remember that an ejector of a similar shape is required. Often the most convenient way of making it is to allow for the punch to be die thickness plus about ⅛ in. for parting off after it is finished to form. This almost halves the total time required in forming these two components.

Clearance for Blanking and Piercing

For the first stage the clearance between punch and die can be increased to the maximum. Double the amount normally recognized for ordinary blanking is satisfactory, as this enables easy return of the blank to the strip, without applying undue stripper and ejector pressure. This practice applies equally to piercing holes that require shaving.

Pitch-controlling holes should be held to the lowest practical clearance limit to avoid returning slugs. All holes in the bolster at this position should be taper-reamed. Another point sometimes overlooked is to machine holes *through* the bolster at the piloting position. These holes should also be taper-reamed, because if the tool is set light or has a short pierce punch, the slug is often not completely cleared and is carried forward and pushed out by the pilot, resulting eventually in a wrecked die.

Guide Posts and Bushings

Four-pin toolings are best where possible. It is a good idea to have these made with the guide pins at the front in the top tool and in the bolster at the rear, or vice versa, but not diagonally opposite. Two objectives are achieved by this: First, regrinding of both punches and dies can be done without dismantling the tool, or grinding between the guide pins. Second, these tools come apart very easily without locking.

Tool Manufacture

In successful manufacture of tools of this nature, it is essential that all parts be accurately ground to limits as close as 2 to 3 tenths. The use of a jig grinder for dowel and piercing holes, and accurate form-grinding equipment for the contours is essential. Slip gages should be used for accurate location, and all angle plates and parallels should be in first-class condition.

After all of the mating sections are squared and sized, the necessary holes are jig-ground. It is more convenient if these holes are dimensioned from a datum point top left or bottom right of *each section* and not from one assembly position as it is so often done. To avoid confusion it is advisable to chart and number the holes on parts. This permits a clearer picture for section dimensions, and profile position, and avoids the danger of misread figures.

The relative positions of piercing holes to pilots are now correct and all that remains is to cut the profiles accurately in themselves and in their correct positions relative to each other.

Cutting the Profiles

This operation is quickly and accurately completed on a horizontal-spindle surface grinder with the "Diaform" wheel-forming attachment (*AM*—August 11, 1949, p146).

The drawing herewith indicates the methods to be adopted in making the templet, and the recommended manner in which they can be used to obtain the blanking and the shaving sizes from the same templet.

The templet is made 10 times that of the shaved component. To obtain the blanking die size, assume the component to be 1/16 in. thick and requiring 0.005-in. shaving on all faces. All that is necessary is to fit a 0.200-in. diameter tracer stylus instead of

0.100-in. stylus and use 0.005-in. radius diamond tool for both forms. The difference of 0.100 in. on the diameter provides the exact amount required for shaving.

To produce the punches, a similar method is adopted. The only differences are that whereas the blanking die is required to be 0.005 in. all round larger than the shaving die, the blanking punch is only required to be 0.001 in. larger. Therefore, a stylus of 0.080-in. diameter with a 0.005-in. radius diamond would be used for the blanking punch, and a normal 0.100-in. stylus for shaving punch.

This example is given purely to demonstrate how accurately ground forms are easily achieved. In a recent tool it was found that, due to the accuracy obtainable in spacing, both the blanking and shaving punches could be identical, the shaving allowance being made only in the die.

MECHANISMS RESEARCH—ROOT OF COST REDUCTION

AFTER 50 YEARS we find that our principles of basic design show little improvement. Convention is still the greatest limiting influence. In most cases, new, high-speed production machinery continues as an oversize outgrowth of the original simple device. Although we have developed new materials, new methods, new engineering approaches, we continue to be saddled by tradition. In an age of social outlook which depends for economic supremacy on ever-increasing production, with available labor, habit is dangerous.

To minimize this weakness, the Armour Research Foundation of Illinois Institute of Technology suggests the organization of a Mechanisms Research group. This would consist of specialists in kinematics, stresses, dynamics, engineering mathematics, vibration, machine design in various fields, production, hydraulics, and electricity. Also available would be experts in such fields as electronics, fluid dynamics, metallurgy, and chemistry. All must question convention!

For a better understanding of the need for such a group, let us consider one machinery problem. Yield strength of cold-rolled steel is 60,000 psi, and that of alloy steel 100,000 psi which simple heat-treat will increase to 140,000 psi. Most handbooks recommend the use of 8000-psi stress for shafting —only 5 to 10% of the steel's inherent strength! Better than 1000% of steel by weight is added as a "safety factor." Multiplication of the fatigue, stress concentration, and dynamic loading factors will produce values as high as 12. Fatigue excepted, the other factors can be analyzed and reduced to a reasonable factor nearer 2, but this requires experience and training beyond the average engineer.

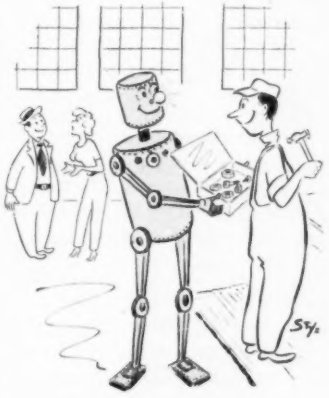
Another daily engineering problem is the stress in components of high-speed reciprocating, rotating, or straight-line motions. Increasing with the speed of displacement of mass, the stresses demand an increase in section which, in turn, increases the stresses. This vicious cycle spirals on to heavier and larger units, ending no one knows where! If we are to improve these conditions, an organization of many and diverse talents is required.

Planned research is one cure. As many as possible of the problems should be worked out in the early stages of development. A careful study of the factors which enter into production must first be made. Paramount among these are quality and cost. Both can be readily broken down into their constituents. Next an evaluation of all production requirements is essential —from which all unnecessary operations are subsequently eliminated. Following this, a master plan is developed, and a study of critical operations made to establish the need for inspection. Then a flow sheet is prepared and the job is ready to go to engineering and inspection for the procurement of necessary equipment. This is common practice.

At this point, however, the approach changes. Instead of going to pilot production next, with its adjustments, modifications, and redesign; instead of troubleshooting hundreds of individual problems after the job is in production—try Mechanisms Research, early in the planning stage.

Turn the product and tooling design, plus the flow sheet, over to the research group. Introduction of the best research and engineering talent at this early stage will avoid much of the usual development on the production line. Start out as close to "the one best way" as possible; it is less costly than the continuous cut-and-try method. This often ends in a last-ditch rush to research, where a miraculous rescue from failure is expected.

In the past, industry has had to rely largely upon ingenuity, judgment, and experience to solve its engineering problems. Mechanisms Research will not and can not supersede these qualities. It will, however, help to remove the costly unscientific inventiveness and eliminate the long periods of trial and improvement which now follow inception of original thought.



"His wife just had a baby!"

ROUND TABLE

Rat's Nest

"Al, you know I'm beginning to see some sense in the Old Man's periodic checkups—and dressing downs."

"What do you mean, Ed—do you like to get inspected, then taken apart? Your men are mechanics, Ed, not housekeepers or in the Army. They're working, not policing the barracks."

"I know they're mechanics, Al, and a bunch of good ones. But even the best of mechanics can get into a rut. Don't you agree that talking up efficiency and teamwork to the men once in a while will be a good thing for them?"

"I don't doubt that it will be a good thing, Ed; but what's the use of burdening yourself with that? Your men are cooperating 100%. You're running a shop, not a football team."

"I don't agree with you there, my friend. Just for laughs I took a stroll around this morning and put down the things I saw that I have been letting slide—with the result that the men let 'em slide too. If I'd give 'em the old hooperdooper once in a while, things like that wouldn't be so obvious."

"What'd you find in your personally conducted research, Ed?"

"Well, under Robert's bench was enough junk to start up a second-hand store, Jones had tools strewn all around him, Higgins had odd bits of stock stacked all over the place—and Harris had a picture in front of his vise, tacked up on the wall, that wasn't bad to look at, between you and me, but whether such a display of art is necessary is a question."

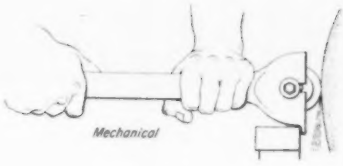
"You mean the shapely babe in the French bathing suit?" smiled Al. "You're not thinking of going bluenose on me, are you? Are you teaching Sunday School too?"

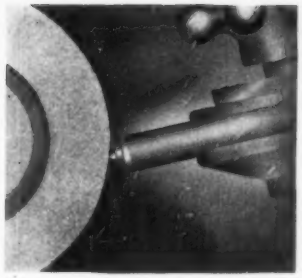
"I don't want to keep harping at the boys, Al, but I think they're getting sloppy in their housekeeping—and that will mean sloppy work and sloppier thinking. I can make a monthly talk to the men that'll make them see these things and they'll do the remedying automatically—I believe in personal efficiency, don't you?"

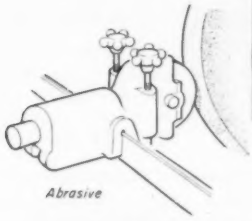
"Let's see, what politics are you practicing for—making a regular speech? And I'll bet, Ed, it will be just about as sincere as a politician after the second month."

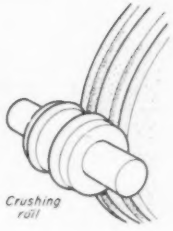
"I can be pretty sincere, Al, about getting rid of real or mental rats' nests.

***IS SLOPPY HOUSEKEEPING** in a plant an indication of sloppy morale? Should men be held to tight standards of appearance and deportment? Which results in higher production—strict discipline or relaxed control? Other readers will be interested in your ideas and opinions on this subject. Discussions of earlier topics appear on later pages.*









Dressing and Truing Grinding Wheels

WHAT TOOLS TO SELECT...HOW TO APPLY THEM

BY MILES J. ROWAN, ASSOCIATE EDITOR

KEY to successful grinding is the wheel. Infinitely variable in its characteristics, the modern grinding wheel can be adapted to widely differing conditions. For rough work or ultra-precision tolerances, for soft materials or those of extreme hardness, for plane surfaces or complex contours—in fact, for the full range of metalworking requirements, wheels can be found to do the job effectively and economically. But selection alone is not enough. To obtain full benefit from a wheel, its working surface must be held at peak efficiency. Dressing and truing do this job, maintaining a wheel that is fully effective and in the proper condition to produce a satisfactory finish on the work. Dressing and truing are essential not only to obtain high production, close sizing, and good finish but also to make possible the high degree of versatility that is afforded by formed wheels in contour grinding.

Described in this report are the major classes of equipment for dressing and truing, the field in which each is applied, and proper operating methods for producing the effects of which each is capable. Included are mechanical, abrasive, and diamond tools for straight-face wheels; and crushing rolls and diamond truing units for the increasingly popular operation of contour grinding by means of formed wheels.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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Why Are Dressing and Truing Necessary?

DRESSING—broadly defined as any operation that alters the cutting action of a grinding wheel—tears dulled abrasive grains from the wheel, removes particles of connecting bond, and opens the wheel voids by removing "picked-up" metal. It exposes new, sharp grains to the work and restores the wheel to maximum cutting efficiency. Truing, on the other hand, creates concentricity in a wheel and imparts the proper form to the wheel face. This form can be either straight or contoured. Depending upon which it is, however, the procedure differs considerably. It is convenient, therefore, to think of truing operations as falling into two major groups: straight-face truing, and form truing. Essentially, then, dressing may be considered a sharpening operation, and truing a shaping operation.

In rough work, such as snagging and off-hand grinding, sharpening is probably the most important consideration. Sharpening directly affects the rate of metal removal, and, in that type of work, fast cutting is of primary importance. But in precision grinding, it is necessary to consider size, finish, and straightness (adherence to contour) in addition to speed of cutting. Thus, the shape and surface of the wheel are all-important. As the work will be no more accurate than the wheel, frequent dressing and truing are essential to insure proper wheel shape and smoothness, as well as sharpness.

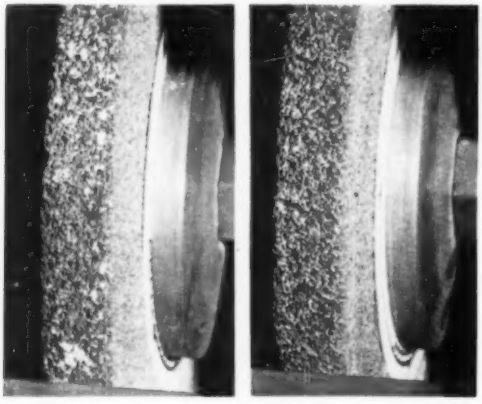
Type of Cutting Action

The need for dressing and truing arises from the nature of the cutting action in the grinding operation. In many respects, a grinding wheel may be thought of as a milling cutter with millions of tiny cutting teeth. These teeth are the sharp abrasive grains held by the bonding material. The bond itself does little or no cutting; its chief purpose is to hold the abrasive properly.

But the kind and amount of bond determines the relative ability of the wheel to hold its grains against the shear and compressive forces set up during grinding. These forces stem from the resistance of the work to grain penetration and chip removal, and, as the cutting edges become dull, increase until they equal the strength of the bond. Grains then are torn from the wheel. In theory, the ideal wheel is one that releases its grains as soon as, but not before, they no longer perform effectively. Such a wheel, in action, is said to be self-sharpening.

Actually, although the relative ability of the wheel to hold its grains—called grade—is controllable in manufacture, it is very difficult to approach the ideal condition in practice. Considerations of economy and of surface finish limit the extent to which self-sharpening action may be permitted in selecting the best wheels for a given application. Wheels that are entirely self-dressing often wear away too rapidly to provide greatest wheel efficiency. Furthermore, the wheel face may break down before the wheel has covered the entire surface of the work. When this occurs, the wheel is too soft for the operation and will fail to maintain work size or contour or to meet work finish requirements. To avoid these conditions, "harder-acting" wheels (more resistant to

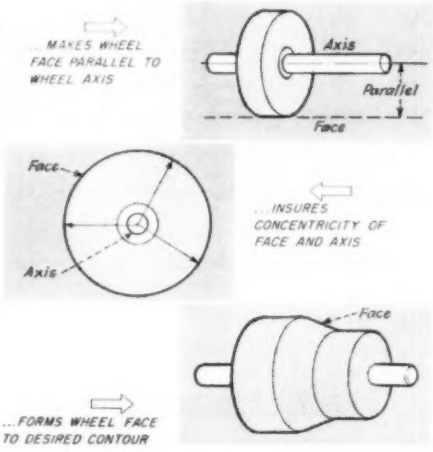
DRESSING restores cutting efficiency

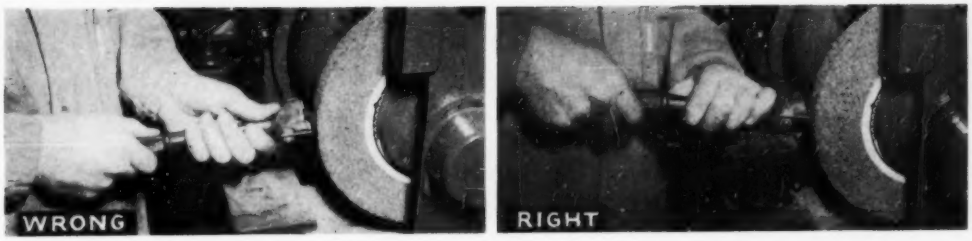


BEFORE . . Wheel is loaded and cannot cut properly

AFTER . . Wheel is open, sharp, and fast cutting

TRUING does these things:





Proper method of dressing and truing with manual tool of above type is to place lugs on holder against fixed support and to traverse tool with left hand. After each pass, right hand tilts holder to feed cutters farther into wheel

wheel breakdown and grain release) must be selected.

Caution must be exercised, however, to avoid a wheel that is too "hard-acting." A major factor in the cost of grinding operations is the rate of metal removal by the wheel. A wheel that is too "hard-acting" will not cut fast enough to be an economical choice, even though wheel life is long. Thus, the best procedure is to consider all factors affecting grinding cost and to determine the wheel that gives the lowest total grinding costs consistent with the desired quality. When this is done, it is often found that the wheel that is best for a given application is not entirely self-sharpening. These wheels then require periodic dressing and truing, to supplement their inherent self-sharpening qualities.

Effect of Loading

Once the best wheel has been determined, the most important step in maintaining proper cutting efficiency is to keep the wheel face open. For ease of cutting and proper chip removal, grains must have adequate clearance. Initially, this is provided by the voids in the wheel. As cutting proceeds, however, some chips do not wash from the wheel with the coolant, but become firmly lodged in the voids. As a result, grain clearance is reduced and wheel cutting capacity is lowered. This condition is called "loading" and is one of the most serious obstacles to obtaining the maximum rate of metal removal from a wheel. The rate of loading can be reduced by the proper selection of grinding fluids, but it can not be eliminated entirely. The only alternative then is to clear the wheel before loading becomes excessive. Dressing and truing accomplish this purpose and thereby maintain the free-cutting action of the wheel.

In any grinding operation, the first step in achieving desired quality at lowest cost is careful wheel selection. Dressing and truing, no matter how skilfully done, cannot overcome the handicap of a wheel that is a poor selection for the job. But once the correct wheel is determined, these operations are absolutely essential to maintain the wheel in proper condition. Only through proper dressing and truing can the full potential of a wheel be realized. And in many cases, supposed wheel troubles are not wheel troubles at all, but actually are dressing and truing problems.

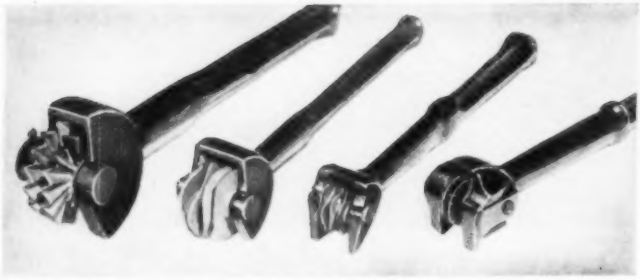
What Methods Apply to Straight-Face Wheels?

DRESSING and truing are often performed in the same operation. To true with a dressing tool, it is only necessary to make sure that the dresser is rigidly fixed in relation to its point of contact with the wheel. But a truing operation does not necessarily dress the wheel properly . A wide variety of effects can be produced on the wheel surface, and the tool, plus the procedure, must be carefully selected to produce a wheel that will meet the requirements for accuracy and finish on the work.

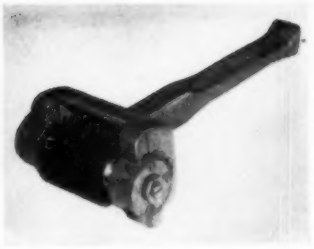
Dressing and truing equipment falls into four main classes: mechanical, abrasive, diamond, and crushing roll. Although there is some overlapping, each class has a major field for which it is best suited. Equipment in the first three groups is made both for manual operation and rigid mounting on the machine.

Hand dressing with any tool, however, requires skill on the part of the operator if consistent results are to be obtained. Both the amount and steadiness of dressing pressure against the wheel depend entirely upon operator judgment and ability. He also must hold the dresser so its axis is parallel to that of the wheel if a square face is to be produced on the wheel. And if a steady rest is not used, the wheel may be dressed out of running tooth. These characteristics of hand dressing are not true of tools rigidly mounted on the machine. In this group, tool infeed and rate of traverse are controlled readily and truing is accomplished automatically.

The cleanliness of the grinding fluid has an important bearing on the frequency of dressing or truing. If dirt or abrasive particles or chips are present in the coolant, they roll between the wheel and the work, score the wheel face, and may necessitate dressing and truing to restore the correct wheel surface. Magnetic separators and filters eliminate much of this trouble and pay off in greater production per



Mechanical hand tools include: corrugated-disk, twisted-disk, and star. Cutters revolve loosely on pin in holder. These tools are for wheels on bench and floor-stand grinders and are made in several sizes to suit wheel needs



Extra-heavy Huntington dressing and truing tool is primarily for higher speeds and is well suited to resinoid or rubber-bonded snagging wheels

dressing, better finish on the work, and lower grinding costs. Similarly, by eliminating the effect of thermal variations on the dimension of accurate work refrigerated grinding fluids aid in establishing better grinding conditions, with improved wheel performance and reduced truing requirements. Another development that is reported to give longer periods between dressing and truing is the passing of coolant through the wheel. Coolant, which must be kept clean to prevent plugging the pores of the wheel, is introduced through the wheel mount and is forced under pressure to the wheel periphery.

Specific dressing and truing practices vary considerably depending upon such factors as: the machine, the grinding operation, the wheel, the work requirements as to tolerance and surface finish, and whether the production is high-volume or job-lot. But one point that is universally applicable is: Never let the wheel go too far. It is false economy to wait until the wheel is in bad shape before reconditioning it. Frequent dressing and truing causes only a few thousandths to be lost from the wheel each time, yet maintains the wheel at a high average level of efficiency throughout its life.

Hand Mechanical Tools

Intended for relatively coarse-grain wheels on operations in which accuracy is of secondary importance to fast grinding is the "star" dresser. Often referred to as the Huntington dresser, cutters on this tool consist of pointed steel disks loosely mounted on a pin with solid circular disks as separators. The cutter unit is mounted in a holder designed for manual operation. Lugs on the holder are held firmly against the work rest or other rigid supports and the tool is moved in a straight line across the wheel face. Used in this way, the tool trues as well as dresses the wheel. After each pass, the holder is tilted farther upward to advance the cutters into the wheel. Eventually, the support must be moved in to prevent the gap between support and wheel from becoming too large. After truing, the support always must be moved in close to the wheel before grinding. The truing operation is performed dry, and bond, dulled grains, and loaded material are removed from the wheel by picking action. Cutter points penetrate several thousandths and the result is an extremely, open fast-cutting wheel.

Major applications of the "star" tool include the dressing and truing of wheels for light snagging and offhand grinding, including bench, and floor-stand equipment, and of cylindrical, cup, and segmental wheels on large surface grinders. In the latter case, the tool usually is mounted on an arm permanently attached to the machine for convenience and speed of operation. Hand tools vary in size and specific application data may be obtained from manufacturers.

Locked-disk truing tools are for medium roughing wheels on production machines. Cutter sets are made up in differing patterns. Brackets provide rigid machine mounting

Similar pointed-tooth cutters are used extensively on disk grinders. Cutter points must be small to enter the wheel and sharpen properly with minimum loss of wheel surface. One manufacturer recommends that points be not more than $\frac{1}{8}$ in. square. As disk grinders often are employed to clean up work to a flat surface, the wheel should be flat after sharpening. Hence, for greater accuracy, cutters are locked on a shaft that rotates on ball bearings. The dresser then is mounted on brackets that permit controlled infeed and traverse of the dresser in a plane parallel to the wheel on both horizontal- and vertical-spindle machines. Dressers are moved steadily across the wheel.

For roughing wheels that do not need the coarse, open structure provided by the star truing tool, corrugated and twisted-disk tools are indicated. These are similar to the star tool except that they have no separators and the corrugated disks often are cast. In operation, however, they combine shearing and crushing action to produce a smoother finish on the wheel. Cutters hold their shape as they wear

and thus last much longer than the star type.

Precision Mechanicals

For commercial grinding, precision mechanical truing tools are sometimes used in place of diamonds. Precision truing tools are of two major types: one consists of individual circular cutters locked rigidly together without separators in an arrangement that results in a series of regularly spaced openings in the OD; the other consists of a solid cylinder with diagonal grooves. In both types, cutters are ball-bearing mounted, and truing accuracy depends upon the perfection of the bearings. Rigidity of the tool mounting is likewise important, for the same reason, and a variety of mounting brackets are made to fit cylindrical, centerless, and surface grinders.

In operation, these tools are set for a line of contact about 1/16 in. below the center of the wheel. Their rate of traverse is rapid and approximately 0.001 in. per pass infeed is employed. As they require much more pressure than a loosely mounted, pointed disk, there is some danger of spalling at the edges of moderate grade wheels.

Abrasive Truing Tools

Abrasive truing tools employ a silicon-carbide vitrified bonded wheel as the cutting agent. Operating with its axis at an angle to that of the grinding wheel, this wheel produces a combination of crushing, wiping, and shearing action. The abrasive cuts out the bond of the grinding wheel and removes any metal that may have been picked up, thus leaving the wheel in condition for fast cutting. Tools of this type are frequently employed in conditioning wheels for pistons, crankshafts, camshafts, and commercially fine finishes on centerless and cylindrical grinders. They also eliminate difficulties on large wheels where slow rpm may cause diamond marks from dressing, and on wheels for grinding soft materials in which diamond marks are readily reproduced. The truing wheel is ball-bearing mounted in a holder that is secured in a bracket rigidly attached to the grinder.

Grooved cylinder is for truing wheels in commercial grinding on general cylindrical work. Holder may be offset as well as straight

Precision abrasive truing tool is for commercially fine finishes on production jobs. Wheel holder is tilted in mounting bracket during truing. Rigidity is essential

Brackets are available in several designs to fit various makes of grinders. Advantages of abrasive truing tools are: they stand rough handling; produce a smooth, clean-cutting surface free from dressing marks; require little skill to operate; and are second only to the pointed-disk tools in efficiency in removing picked-up metal.

As several variables are subject to close control in setups employing the abrasive truing tool, a wide variety of effects on the grinding wheel are possible. For example, truing wheels should be around a 16-grit, *U* grade, for roughing and around a 20-grit, *S* grade for finishing wheels. If a smoother surface is required on the ground part, a finer grain size—say a 46-grit—is recommended for the truing wheel. Grades *U* and *S* are satisfactory for relatively hard grade grinding wheels, such as *N* to *R*. For softer grinding wheels, softer truing wheels may be selected. Furthermore, the angle between the axes of the truing and grinding wheels, affects the amount of shear in the truing operation. Zero angle reduces the shear and results in a rougher wheel. But as the angle is increased, more shear is introduced and the wheel becomes smoother. For general use, an angle of 5 to 7° from the vertical is satisfactory. A third variable is infeed, with heavier cuts producing rougher wheel faces.

For satisfactory results, the truing wheel must be true when the operation begins. Truing is accomplished by setting the wheel at a 10 to 15° angle and taking a light cut against the grinding wheel.

During truing, the wheel must not pass out of contact with the grinding wheel. Were this to occur, the dresser would slow down and, because of its reduced speed, would tend to gouge the wheel when contact once more was made. There is also a tendency to produce either an angular or a slightly rounded face on the wheel. Furthermore, the total area of contact decreases as the dresser runs off the wheel. As this occurs the dresser penetrates deeper into the wheel, and there is danger that the edges of either or both wheels may break. Generally, no more than one-third of the wheel face should pass out of contact with the grinding wheel. When the operation is completed, the truing wheel always should be run off of the same edge of the grinding wheel, and wheels should be cleared of dirt and grit.

Recommended practice for abrasive wheel dressers follows: for semi-roughing work, traverse the dresser at approximately 40 ipm with a feed of 0.002 to 0.003 in. each pass. For commercial finishes, start as before, then reduce the traverse to 20 ipm and take several passes with a feed of 0.001 in. For medium-fine finishes, after above procedure, reduce the traverse to 10 ipm with the same feed and make the final pass with no infeed. For fine surfaces, proceed as for medium-fine finishes, but use a coolant at each stage.

Abrasive Stick Dressers

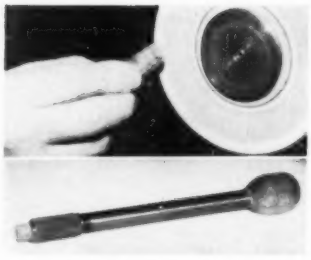
Abrasive dressing sticks are useful in toolroom work for forming

wheels and for dressing wheels of thin section. Other applications are to provide side clearance on grinding wheels and to take roughing cuts on dual-purpose wheels which are to be trued with a diamond or other precision tool for the finish cut. In action, abrasive sticks shear off grains rather than penetrate the bond deeply.

Truing Tool for Diamond Wheel

A new development in abrasive tools is a brake-controlled device that speeds and simplifies the truing of diamond wheels. With this tool, a diamond wheel can be trued effectively while the latter is running at grinding speed. Applicable to straight, cylindrical, cup, internal, and cutoff wheels, the unit is effective on metal and vitrified bonded diamond wheels and on resinoid bonded wheels up to 220 grit.

In action, the truing wheel is driven by the diamond wheel operating at normal speed. The truing-wheel speed is controlled by brake shoes which are held to a flywheel on the shaft under adjustable spring pressure. Centrifugal force causes the shoes to bear against the flywheel housing in a manner which permits free rotation of the truing wheel at low speeds but limits it to a predetermined maximum speed. Maximum truing wheel speeds commonly used are in the range of 1000 to 1500 sfpm.

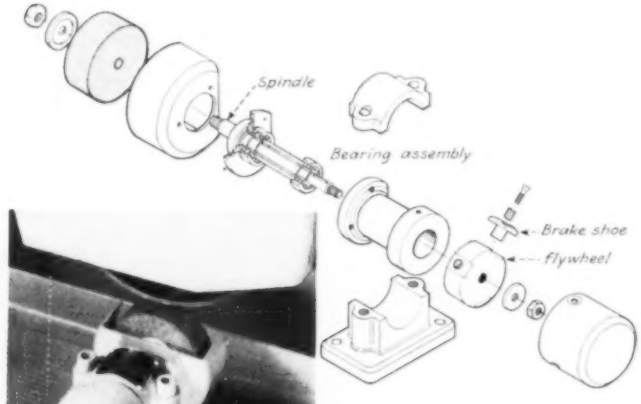


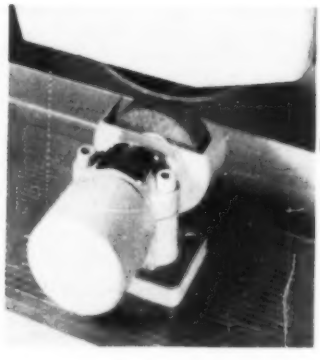
Abrasive sticks are held manually or in magazine. Latter can be fed forward as tip wears away

Silicon-carbide vitrified wheels are employed as the truing agent. For 100- to 180-grit diamond wheels, a 60-grit, *M*-grade wheel is satisfactory, and for coarser or finer wheels correspondingly coarser and finer truing wheels are selected. Traverse ranges from 30 to 60 ipm with a downfeed of 0.0005 to 0.001 in. at the end of each stroke. Resinoid wheels often clean up after 0.005 to 0.010 in. total truing feed; metal and vitrified bonded wheels need from 0.010 to 0.020 in. total.

Other operating instructions include: dry operation; movement of the truing wheel beyond the diamond wheel during each pass; and reduction of feed for the final passes to prevent crowning of the diamond wheel. If the truing wheel is placed at an angle to the diamond wheel it is apt to chip an edge of the latter. After truing with the brake-controlled tool, the face of the diamond wheel is apt to be smooth and to require subsequent hand dressing with an abrasive stick to "sharpen" it.

Another method of truing is to mount the diamond wheel on a cylindrical machine and grind with a soft-grade silicon carbide wheel of about 80-grit size. In this case, the diamond wheel is run at less than normal grinding speed. After truing, the wheel is dressed and cleaned with a fine, soft silicon-carbide stick or pumice.





Brake-controlled abrasive wheel speeds truing of diamond wheels. Diamond wheel is run at normal speed to drive abrasive wheel. Brakeshoes on flywheel can be adjusted to give truing-wheel speed of 1000, 1250, or 1500 sfpm

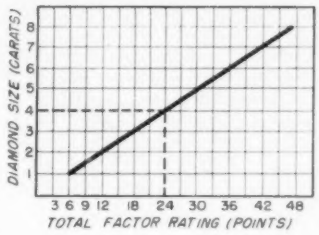
Diamond Truing Tools

The earliest and still most widely used tool for the truing of grinding wheels on precision work is the diamond. Hardest of all known substances, the diamond has excellent resistance to abrasion and, if properly cared for, is a tool that will give long life in service. It is brittle, however, and cannot withstand mechanical shock or sudden changes in temperature. This, coupled with its comparatively high initial cost, introduces the possibility of an appreciable loss if mistreatment by a careless or inexperienced operator should result in a broken diamond. For this reason, the precision mechanical and abrasive wheel truing tools are competing with the diamond in the areas already mentioned. But for close tolerances, high surface finish, speed of operation on straight-face wheels, flexibility in the kind of wheel surfaces it will produce, and general all-around usefulness in grinding, the diamond has yet to be equaled.

In considering diamond truing tools it must be remembered that no two stones are exactly alike in their inherent characteristics. Beyond this, the life of the diamond and the quality of the wheel surface it produces depend primarily upon selection of the right diamond for the job and adherence to proper truing techniques.

TABLE AND CHART GUIDE SELECTION OF DIAMONDS FOR TRUING WORK

Factor Rating (Points)	Basic Factors In Determining Diamond Size					
	Wheel Diameter (In.)	Wheel Face (In.)	Grit	Grade	Bond	Abrasive
1	Up to 6	1	40 to 80	Soft	Vitrified or Silicate	Aluminum Oxide
2	6 to 12	2		Medium	Shellac	
3	12 to 16		90 and Finer			
4	16 to 20	3			Resinoid	
5	20 to 24					
6	24 to 30	4	12 to 36	Hard	Rubber	Silicon Carbide
7	30 to 36					
8	36 to 40	5				
10		6				
12	.....	7	.....	Very Hard		
14		8				
16		9				
18		10				



Diamond size can be determined approximately by selecting from left column of table the point rating that corresponds to wheel specification listed under each basic factor column. Referring to chart, sum of factor ratings indicates approximate diamond size for any given wheel

Diamonds are selected by carat size. Size is of importance chiefly as a measure of the strength of both the stone and its setting and of the ability of the stone to dissipate heat from the cutting point. Large or coarse wheels require large diamonds, while fine-grain wheels are best dressed with small stones.

In determining the size of diamond for a given wheel, there are six major factors to be considered. These are presented in an accompanying table which includes a rating scale for assigning point values for each of the six factors. Point values then can be totaled and, from the chart listing recommended diamond sizes for point value totals, the proper diamond size can be selected.

The useful part of a diamond is the point or edge. Once this has worn flat, dressing action deteriorates. Pressure on the diamond increases and temperature rises; abrasive grains are not fractured and the wheel is glazed or dulled rather than opened. Furthermore, the diamond area adjoining the points is somewhat softer and wears much more rapidly than does the point itself. Therefore, good practice in truing calls for several steps that protect the diamond point and thus help not only to maintain the wheel at top cutting efficiency but also to minimize diamond wear.

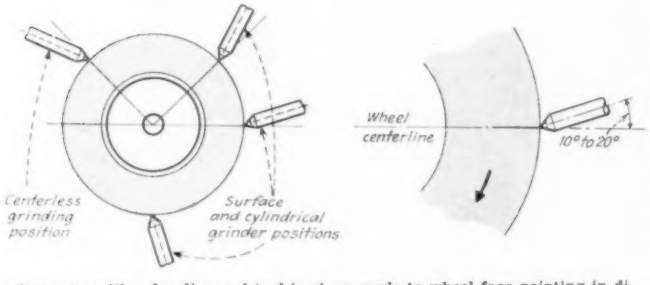
Position of Diamond

Of major importance is the practice of setting the truing tool so its centerline falls on or slightly below that of the grinding wheel and is at an angle to the wheel. The angle should be from 10 to 20° and point in the same direction as the grinding-wheel travel. In this way the diamond "drags" on the wheel and there is no danger of gouging the surface. With too much angle, the wheel grinds away the metal in which the stone is mounted, while with zero angle, the diamond points directly at the wheel centerline. The wheel then acts against the grain of the diamond, rather than along it, and rapidly grinds away the point. But if the tool is set at the proper angle, these difficulties are avoided.

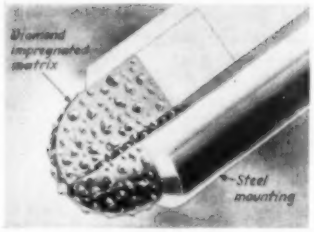
Another requirement is to take light cuts with each pass across the wheel. No more than 0.001 in. per pass is recommended. This holds the strain on the tool within reasonable limits.

For maximum dressings per diamond, it is extremely important that the nib be turned in its holder frequently. Because the nib is set at an angle to the wheel, turning causes a new sharp cutting edge to be presented to the wheel. In this way, wear is distributed evenly, large flats in the diamond are avoided, and, in effect, the stone sharpens itself.

Wherever possible, coolants should be used during truing to avoid overheating the diamond. The coolant should flood the diamond and the entire surface of the wheel, and always should be turned on before the diamond contacts the wheel. If the wheel is dressed dry, frequent cooling periods should be allowed. As sudden changes in tem-



Correct position for diamond tool is at an angle to wheel face pointing in direction of wheel travel. If in doubt as to wheel centerline, drop point ⅛ in. for safety. Correct positioning avoids damage to diamond and wheel



Diamond impregnated tool has matrix of cemented carbide that protects embedded diamonds if accidental damage occurs to those on tip

perature can shatter a stone, hot diamonds should be allowed to cool naturally, and never should be quenched in water or coolant.

Truing should begin at the highest point on the wheel. Light cuts then may be taken until the face is square. Starting at a low point may result in an excessive cut and consequent damage to diamond mounting, and wheel.

Control over Finish

Many previously mentioned factors also are involved in controlling the finish produced on the wheel. A depth of cut of 0.001 in. leaves an open wheel surface that is satisfactory for roughing work. For finer finishes the infeed is reduced, and for the finest surfaces the diamond should be passed across the wheel several times with no infeed.

Rate of traverse also affects the wheel surface. Rapid traverse produces a fast-cutting wheel but may leave diamond marks which will be transferred to the work. Slow traverse gives a wheel that will produce fine finishes, but too slow traverse will glaze or dull the wheel face. Grade and grain, as well as finish, also influence traverse and the exact rate that is best for each job can be determined only by trial. To avoid grooving the wheel, traverse should be engaged before the diamond touches the wheel.

Despite all precautions, however, dressing will not be satisfactory unless the tool is solidly supported with a minimum of overhang. Looseness or insufficient support will cause chatter, diamond marks, gouging, or breakage of the diamond.

The diamond regarded as most satisfactory for the majority of truing is the octahedron. This diamond has six points and, as one wears down, may be reset to expose another. The exact time for resetting is largely a matter of judgment. One manufacturer recommends that the diamond be reset when the worn flat is 10% of the exposed part of the stone. Regardless of the exact figure, however, the important thing to remember is this: Excessive wear on any one point may consume so much of the stone that there will not be enough left to permit proper mounting in other positions. If this occurs, it is impossible to use all points on the stone and the user fails to obtain full benefit from his investment. As the perfect octahedron provides six sharp, hard cutting points, it is capable of more top quality truings per carat than a less perfectly shaped diamond. For this reason, it should be selected where close tolerance and high finish are important on the finished product.

Less expensive than an octahedron of the same class is the elongated diamond, which has only two useful cutting points and is reset only once. The elongated diamond generally is satisfactory for average work on the large wheels, and is recommended for fine work on small internal wheels where stones as small as 1/5 to ¾ carat often are employed.

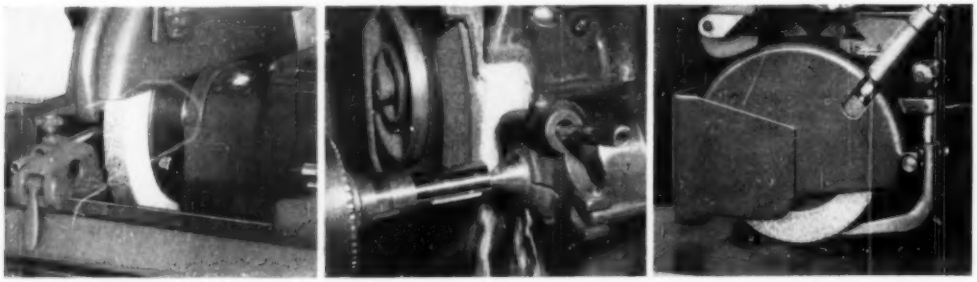
Small Diamonds

With diamonds, the points are preferred for dressing and truing, but, after timely resetting so each of the six points of the octahedron has given satisfactory service, the body of the stone is left intact. This remainder of the octahedron can still be put to useful work—especially if the exposed part is formed to a cone or chisel shape artificially.

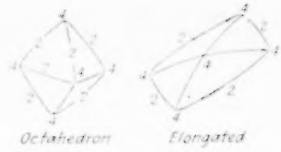
Tools also are made with cone points for small-radius work. Small octahedron-shaped stones that have absolutely sharp points are likewise applied for small radii. The latter stones are known as needle points or crystals.

The diamond must be held securely to withstand pressure and vibration during truing. A loose stone may be severely damaged or even torn from the tool and lost. Furthermore, the diamond may score the wheel such that scratches are produced on the work.

At one time small stones often were difficult to reset securely after they had been reduced in size by wear. In recent years, however, special alloys, powdered metals,

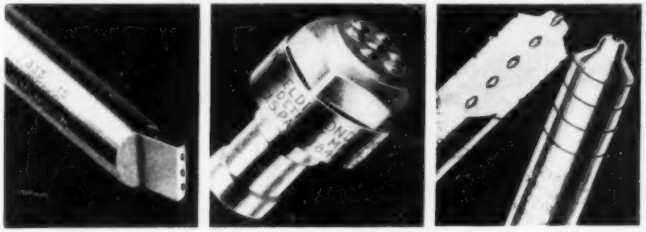


Straight-face truing setups place the diamond either on the machine table, the footstock, or the wheel head. Many variations exist among different grinders as to exact method of mounting diamond and fineness of control over truing action. Range extends from completely manual devices to those that are fully automatic, in which truing occurs in split second and removes less than 0.0005 in. Proper truing permits high precision on production jobs



Octahedron and elongated diamonds both contain points formed by four planes (4), and edges formed by two planes (2). Points resist wear but surfaces in between are flaky and wear rapidly. Stones should be reset when point area wears away

Cone-point is tiny elongated stone with point ground to cone for fine wheels such as in tap grinding and for small radii in form truing



Multiple-diamond truing tools contain stones that are too small to be reset. Mounting materials hold stones securely until they are almost entirely worn away These are for general work

and cemented carbides have been developed as mounting materials. Settings of these materials hold stones much more securely than formerly was possible, and thus permit resetting the smaller diamonds.

As these mounts also can be ground away without releasing the stone and without harming the wheel, they permit a stone to be entirely consumed without resetting. This makes possible the use of diamonds that are too small to be practical if resetting is necessary.

As six smaller stones are cheaper than an octahedron of the same total weight that can be reset to provide six usable cutting points, and as all of the diamond is consumed, savings may result from the application of small stones. Yet, they must be used with care, and should be applied in accordance with their performance capabilities. Generally, the small, consumable stones are best suited to small wheels and fine grits.

Small diamonds with consumable mountings also are found in multi-point tools in both straight-line and cluster arrangements. In a seven-stone cluster, from 2 to 4 of the diamonds are in contact with the wheel at all times, each supposedly taking a proportionate share of the load. As the stones are small, the flat on each diamond never becomes large. The straight-line tool is applied to the wheel at a "drag" angle with all stones in contact simultaneously in the horizontal plane. As points wear, the tool is given a one-half turn in its holder. In practice, it is difficult to be sure that the truing work is equally divided among the stones of a multi-point tool. If one stone does all the work, wear is rapid and truing action may be poor. In the cluster arrangements, tools also are made with two or more layers of stones, with the lower layer so positioned that it comes into action before the top layer is fully used. A third type of tool has several diamonds mounted in a row. As one wears out the mount is ground back to expose another. Otherwise, these are used as any single-point tool.

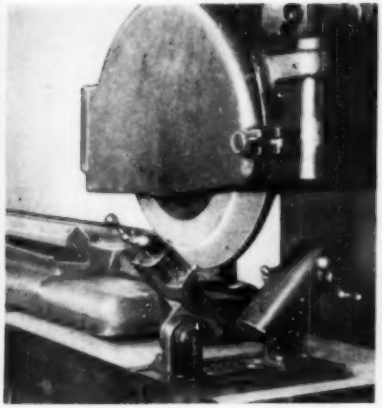
The principle of using inexpensive diamonds that are consumed without resetting also is applied in another tool that has a special alloy or cemented carbide matrix which is impregnated with small whole diamonds or diamond particles. As the outer layer of stones wears away, those below are exposed. The matrix dissipates heat well and the tool can be applied to wheels of any size, bond, and hardness. In case of rough treatment, only a small area normally is affected.

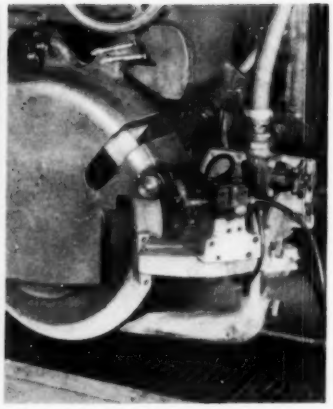
A practical tool for the unskilled operator is a hand, diamond tool that is intended for general use such as on bench and floorstand grinders. A number of small consumable diamonds are set in an alloy strip that holds them until they are entirely consumed.

Mounting the Nib

Diamond nibs are made in a wide variety of shapes and dimensions to suit the holders on standard grinders. Also obtainable are numerous special holders with adjustable heads so the diamond can be presented to the wheel at the proper angle to avoid chatter and to permit self-sharpening by turning. On surface grinders, with a magnetic chuck, the nib oftentimes is mounted in a steel block, which then is held in position on the chuck. Table or foot-stock mounting is common on cylindrical center-type machines. These fixtures normally hold an 8 to 12 in. round bar in which the nib is mounted. On some machines, however, a holder is provided in which the nib can be inserted directly. On others, the truing device is an integral part of the machine. Thread, centerless, and internal grinders are built this way, as are some models of surface and cylindrical grinders. In many cases, these built-in units can be tied in with an automatic sizing device to provide full automatic cycling.

For greatest effectiveness in grinding, the diamond must produce a wheel in which grains are completely fractured and protrude above the bond. This can be done only with a sharp stone. Thus, selection of the proper diamond for the wheel and careful attention to the precautions that maintain the diamond in good condition are among major factors in obtaining top performance from the wheel.





Angle-truing devices shape wheels for form grinding or clearance. For high-production work, power-driven versions, such as that at right, provide fast, accurate forming. Device at right does same job as that in center, but in fraction of time. Wheels on cylindrical, centerless, and internal grinders also can be shaped

How To True Formed Wheels

ONCE a lengthy operation, the shaping of grinding wheels now can be done quickly and easily by operators who are not highly skilled. As a result, parts of complex contour can be produced to close tolerances at low cost. Both toolroom and production items can be duplicated with greater precision and less opportunity for error —particularly where angles, flats, and radii must be blended into smooth shapes. Making this development possible is a group of fast, dependable truing devices that meet the requirements of a full range of work from simple to complicated contours and of various levels of production from small to large quantities.

The simplest tools for forming contours on the wheel face are abrasive sticks, boron carbide sticks, and diamond hand tools. The latter are made up in a variety of shapes and sizes for convenience in application. As wheels are shaped by hand with these tools, their greatest value in form work is on pieces for which contours are not known but must be developed.

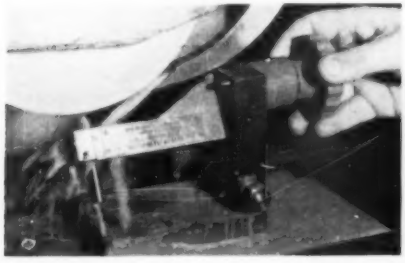
Diamond Truing Devices

For known angles or radii, fixtures are employed to hold the diamond in a pre-determined position with reference to the wheel and to permit travel of the diamond across the wheel face along the desired plane or arc. Some of these fixtures form only one surface—either an angle or a radius. Others do both but require a separate setup for each form. Still others permit consecutive movements in which one or two angles are tangent to a radius that may be as much as 180°. Concave or convex surfaces can be formed with the same tool, but as a different setup is required for each, they cannot be done in the same operation. Essentially, tools of this type are for shops in which the volume of contour work does not justify a greater investment.

Angles and Radii

An angle is formed on a wheel by swiveling the fixture base to the given angle and then moving the diamond along this plane. As the wheel wears down, the fixture permits adjusting the plane of the diamond travel closer to the wheel.

In radial devices, to obtain a true radius, the diamond point must be centered in the nib and the tool post must position the point on a radial line through the axis of rotation of the fixture. Then, it must be possible to move the point of the diamond to a position in front of or in back of this axis and in this way a concave or convex surface, respectively, is produced. The



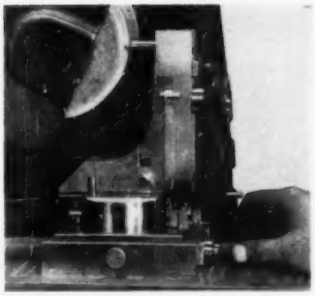
Radius-forming tools hold diamond in back of, or in front of, axis of rotation of tool. Axis can be horizontal or vertical

diamond must contact the wheel on a radial centerline. The maximum height to which the diamond can be set fixes the largest diameter wheel that can be formed with a fixture that rotates about the vertical axis.

Full 180° concave radii as small as 1/16 in. can be formed with an attachment in which the diamond holder is mounted in the vertical position for minimum interference with the sides of the form. For the smallest radius, the center of the diamond holder is set directly above the center of rotation of the fixture. Holders are made in several sizes for progressively larger radii up to about 0.0250 in.

On the small radii, however, it is not always practical to form a 180° concave shape in the wheel, as the diamond is delicate and the operation is slow. In such cases, it is preferable to form half the arc on a corner of the wheel and then come in to the work from each side. Larger diamonds then can be applied and the smallest radius possible is determined by the angle of the diamond and the radius on its point.

Fixtures based upon the principles outlined are produced in several designs by truing-equipment manufacturers, and many grinder manufacturers also make units of these types designed particularly for attachment to the various models in their line.



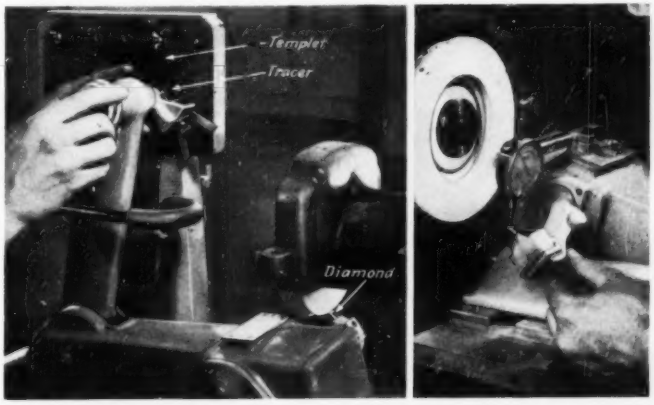
Angle-tangent-to-radius truing tools are precision devices that can form two different angles tangent to a given radius in three successive motions. Tools can be set up for concave as well as convex radii

Complex Contours

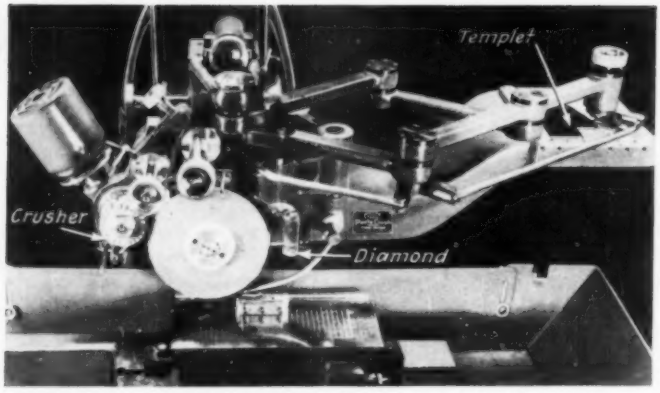
For truing complete profiles of unlimited variation for small- and medium-lot orders, two major types of fixtures can be selected. In one, the diamond duplicates the contour of a templet through a pantograph linkage. In the other, the diamond is mounted in a floating holder that is actuated by a cam or forming bar to produce the required shape in the wheel. In the latter type, the bar usually is stationary on the machine and, as the diamond holder moves along, imparts the correct transverse motion to produce the desired shape in in the wheel face.

In a pantograph unit, the diamond duplicates the motion path of a tracer moving over a templet, but does so with a reduction in motion in proportion to the pantograph ratio. The templet is the exact form that is required in the wheel but is enlarged by an amount equal to the pantograph ratio. Likewise, the tracer is larger than the diamond by the amount of the pantograph ratio and is the exact form of the diamond except that its working angle must be slightly larger than that of the diamond. This prevents the sides of the diamond from digging into the wheel deeper than the intended form or the wheel undercutting the shank. The diamond rocks about its own point to address the wheel in the correct position throughout the contour. This is controlled by the position in which the tracer is held and prevents localized wear on the diamond when truing steep-sided forms. The diamond point must be central with the nib, the nib central with the diamond arm, and the tracer central with the tracer arm —ie, the center of the radii of the diamond and the tracer must be on their respective centers of rotation. Likewise, the diamond must work on a radial centerline of the wheel. These features are necessary to obtain a true reproduction of the templet form, and each unit provides means for checking and adjusting to insure a correct setup. Depending upon the contour to be formed, diamonds of different radii are selected. Stones as small as 0.005-in. radius are used for the finest work. The pantograph units will dress up to ½ in. deep forms on wheels up to 10 in. in diameter and 1 in. wide. For wider work increments of the whole profile are dressed into the wheel progressively.

High accuracy is possible with these units, as the ratio between tracer and diamond reduces errors in the templet such that they are practically negligible in the wheel.



Pantographic truing device accurately reproduces shape of templet in wheel at 10:1 reduction. Unit is portable with steel aligning plates for mounting on magnetic chuck of surface grinder. Chisel-point diamond is set exactly central with dresser-arm spindle and on wheel centerline. Form is cut into wheel with successive passes of tracer over templet. Tangential guards prevent damage to diamond mount. Usually, three diamonds, roughing of 0.030-in. radius and finishing of 0.010-in. and 0.005-in. radius are used, depending on contour. Work is accurate dimensionally to less than 0.0005 in.



Pantograph and crushing unit are combined in attachment for permanent mounting on surface grinder. Pantograph controls diamond for duplicating shape of templet in wheel at 10:1 reduction. Crushing roll is self-contained, having own power unit and controls. Roll maintains wheel for fast, cool grinding; for high accuracy, diamond truing is available

For example, with a 10:1 ratio an error of ±0.001 in. on the templet is ±0.0001 in. on the wheel.

Roll and Diamond Device

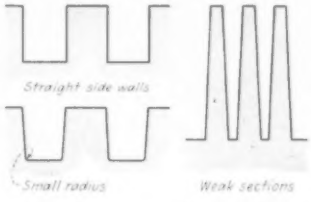
Providing extreme flexibility, an attachment designed for permanent mounting on a surface grinder combines roll-crushing and pantographic diamond-truing in one mechanism. As it is possible to switch from one method to the other without disturbing either the work or the location of the truing device, each method can be applied to the work for which it is best suited. For example, where extreme accuracy is involved, the part can be rough-ground to within a few thousandths with the wheel crush-trued, then finished to size with the wheel diamond-trued. This permits taking advantage of the faster-cutting properties of the crushed wheel, and of the higher accuracy of the diamond-trued wheel. Normally, most work is done with the crusher, saving the diamond for finish grinding or for restoring the wheel shape to regrind the roll.

In operation, the wheel first is trued with the diamond from the templet; the wheel grinds a blank roll, which is driven on its own spindle during the operation; the roll then maintains the wheel in shape during grinding and the diamond shapes the wheel to maintain the roll as required.

Multiple Diamond Units

In addition to tools employing one diamond, there are devices with two or more diamonds for the rapid truing of shaped wheels. Many gear and thread grinders with single-rib wheels are so equipped. Often, these units are integral with the machine, automatic in operation, and tied in with automatic sizing equipment that compensates for the amount of wheel removed in truing.

For diamond-truing multi-rib wheels on thread grinders, a single, accurately formed and centralized diamond moves across the wheel in a motion path controlled by a former of the desired shape. Truing every rib of the wheel on anything but the coarser pitches requires a small, sharp-pointed diamond. As this stone is fragile, it may be found advisable to true only every other rib of the wheel.



Difficult forms to crush, these should be avoided

This practice allows the use of a more substantial diamond for the forming operation.

Another single-diamond device for truing multi-rib wheels is mounted between centers on the worktable so the diamond traverses according to the lead set up on the grinder. The attachment is driven by the faceplate of the machine and this rotation is transferred through gears to a shaft carrying a cam that moves the diamond horizontally in a slide normal to the work centerline. Every 360° the diamond moves through one full pitch space of the thread. Cam and diamond forms can be varied with lead increments to produce a variety of thread forms.

In thread-grinding operations, resinoid bonded wheels grind effectively at speeds as high as 12,000 fpm and work speed can be increased over that permissible with vitrified wheel. As a result, a multi-rib resinoid wheel, which is diamond-trued, is capable of an over-all grinding cycle that is somewhat lower than that obtained with a crush-formed vitrified wheel. The resinoid wheel is hard on the diamond, however, and stones will not last as long as on vitrified wheels. Slowing the resinoid wheel to about 6000 fpm during truing partially offsets this condition.

Crush Forming Devices

An increasingly prominent method of form truing a grinding wheel is with crushing rolls. In this method a roll, shaped to the desired profile, produces its complementary form in the wheel. In grinding the wheel then duplicates the original contour in the work.

Originally developed for thread grinders, the method also is widely applied for high-production work both on centerless and center-type cylindrical grinders employing plunge cuts and on surface grinders with reciprocating table traverse. It is also possible on some jobs to apply crush truing to internal grinders. Regardless of the machine, however, crush forming is an extremely fast method for the producion of irregular shapes and contours. And in the produc-

tion of threaded parts it is largely because of the crushing process that grinding can compete on an economical basis with helical-form and multiple-thread milling. The process is ideally suited to large quantity orders on flat and round work, yet often is practical on small lots if orders repeat. Circular form tools, die segments, and other toolroom items are examples of work in this class. Although crush truing can be performed on straight-face wheels, it is not practical or economical to do so. Crushing on a wheel of this shape requires much more time than truing with a diamond.

Wheels trued by the crushing method are faster cutting and cooler operating than wheels of the same specification that are trued with a diamond. This stems from the fact that crushing produces a wheel with many sharp-pointed grains, while the diamond-trued wheel contains numerous grains with flat surfaces. These cause an increased area of contact between grain and work, with resultant higher friction and heat. On the other hand, these duller grains produce a surface finish that is superior to that of the sharper-faced crushed wheels.

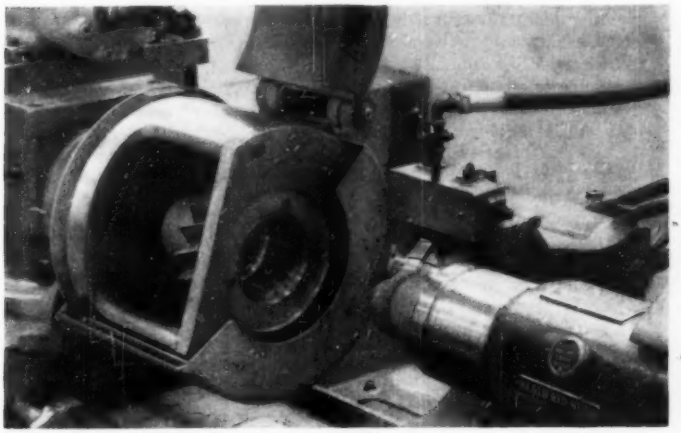
Assuming that deflection can be eliminated during the truing operation, the accuracy of a crushed form depends upon the accuracy with which the formed roll can be produced. With precision equipment this runs around 0.0002 to 0.0003 in. Jobs requiring tolerances as close as this should be carefully analyzed to determine the crushing method that is best from the point of view of over-all cost, as degree of accuracy required is an important factor in this regard. Tolerances encountered on many production parts, however, such as ±0.001 in., can be held without difficulty with conventional methods on forms that are adapted to the crushing process.

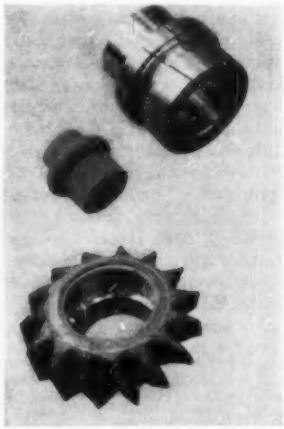
Two Major Types

Crushing units are of two major types: idler, in which the grinding wheel drives the roll, and power-driven. In the latter type, a small motor drives the roll, which rotates the wheel through frictional contact. The idler is the preferred unit as it is thought that less wear occurs on the roll when the wheel is the driving member. But, as the wheel usually is rotated at a much slower speed during crushing than during grinding, the machine should have a two-speed spindle to permit the use of the idler method in the conventional manner. Machines that have only one spindle speed can be equipped with the power-driven unit. The wheel idles while the roll drives at the proper speed. An alternative is to revise the machine by adding a speed-control device, an auxiliary motor on the spindle, or a conversion unit to the wheel head.

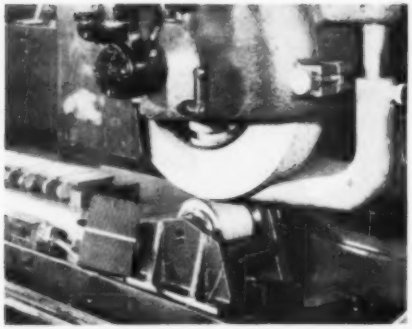
Crushing units may be mounted on the wheel slide or on the machine table. Thread, centerless, and center - type grinders normally carry an idler roll on the wheel slide. On the center-type machine, however, a roll can be attached to table behind the tailstock. A pin on the wheel head engages the roll unit to insure perfect alignment during truing.

On surface grinders, table mounting is customary. Small-lot jobs can be done with one roll, but on high-production work a setup employing two rolls is advisable. One is the work roll, which is power-driven; the other is the master or reference roll and is an idler. With the power off and the roll acting as an idler, the wheel is trued on the work roll initially and for all subsequent crushings until the roll wears beyond tolerance. The wheel then is trued on the master roll, after which the wheel is returned to the work roll. With the wheel running at grinding speed and the work roll rotating under power in the opposite direction, the wheel restores the proper form to the work roll. Grinding and truing

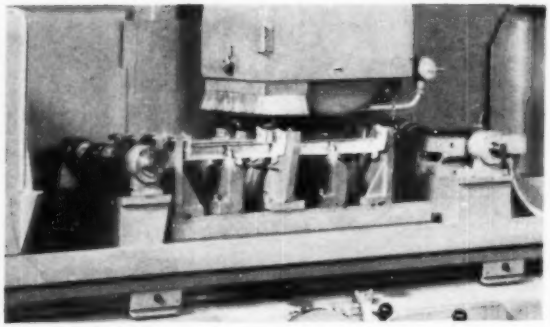




Crush-formed internal wheel plunge-grinds combination of straight bores and radii in oil-well rock bits. Machine is arranged with automatic sizing so, after operator loads part in balloon fixture and pushes button, machine proceeds through full cycle, roughing and finishing contour and truing wheel automatically. Roll is shown in crushing position. Wheel slows to proper speed during operation. At right are part, wheel, and roll



Single-roll setup forms wheel for grinding serrations on parts arranged in multiple on magnetic chuck. During crushing, roll idles and wheel is driven at slow speed by auxiliary motor on spindle



Two-roll setup has idler master roll at left end of table and power-driven work roll at other end. Arrangement shown is double purpose, permitting shave-tool method of forming soft crusher roll as well as two-roll operation with hardened rolls. Setup grinds ball race for typewriter carriage in multiple

then proceed as before. In this way, a great many pieces can be obtained from one set of rolls without removing them from the machine or disturbing their alignment. Regardless of the crushing setup, however, the roll must be rigidly mounted, its axis must be parallel to that of the wheel, and no end-play is permissible in the bearings of either the roll or the wheel.

Crushing Rolls

Most crushing rolls are made of an 18-4-1 high-speed steel and the contour is ground after the blank is hardenend to 62 or 64 R_c. Increasing use is being made, however, of soft rolls that can be restored to shape with a carbide form tool. Free machining steel or close-grain cast iron is employed and the form tool is mounted on a slide that is integral with a motor-driven crushing roll. Two speeds are provided: one for crushing, the other for shaving; the roll also can be idled. This method is recommended particularly for tools and flat-form production parts on which precision and uniformity is essential. Chasers and thread-rolling dies, for example, may specify tolerances to 0.0002 in. If a hardened, high-speed steel roll is applied to a job of this kind, relatively few crushings are obtained before the roll is worn outside the tolerance. Frequent regrinding is necessary and, as the form must be ground to such close limits, an expensive, precision operation is required. With a soft roll and carbide form tool, however, reconditioning can be done quickly and accurately without removing the roll from the unit. The disadvantage, of course, is that the roll wears faster and must be restored to shape more often than hardened steel rolls. In general, to obtain the most economical crusher, it is necessary to balance the cost of producing the roll and maintaining its form against the service life obtained, the quantities involved, and the tolerances that must be met. Carbide rolls, for example, require an expensive grinding operation with a diamond wheel. Thus, they have not been applied widely despite their high resistance to wear.

Rolls run from 3 to 6 in. on the OD, but it is recommended that the smallest practical diameter be used, as a smaller area of contact between roll and wheel requires less crushing pressure. In width, rolls run as high as 9.5 in. Actually, there is no limitation on the size of the roll if the grinder has enough power to build up the necessary pressure and sufficient rigidity to take the thrust during crushing.

Helical slots, called gashes, were at one time considered necessary in all crushing rolls. Present thought, however, is that they should be used only for very deep forms, or those that are considerably out of balance, and for hard wheels. Their main purpose is to aid penetration of the wheel and permit faster crushing.

The roll form is an exact duplicate of that required in the work except in helical groove or thread grinding. With zero-helix-angle wheel setting, helical interference between the wheel and work may prevent meeting specifications for root clearance. To eliminate this interference, the wheel can be set at the helix angle of the product. This then requires shortening the lead spacing of the crusher roll in proportion to the cosine of the helix-angle setting. Likewise, in grinding small worms with wheel faces up to 1 or 1¼ in. and with the head set at the helix angle of the work, the roll is made to the form of the normal gear tooth rack for pitch-line helices up to 15° in the range from 20 to 60 DP. But for helix angles over 15° correction must be made in the roll profile to produce the proper form.

Wheels for Crush Forming

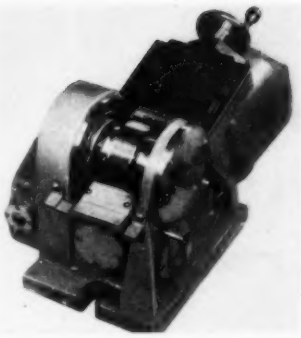
Vitrified wheels are the only ones that can be crush-formed satisfactorily. Organic bonds are too resilient to build up sufficient pressure between the roll and wheel to crush. Resinoid, rubber, and shellac wheels tend to break out in crushed clusters, thus preventing duplication of form. In the vitrified-bond, both aluminum oxide and silicon carbide abrasive wheels may be crush-formed and 120 to

220 grit wheels are most frequently selected. Oftentimes, the wheel is a combination of two or more sizes in this range. Basically, grit size is governed by the smallest radius that must be crushed. The sharper the form, the finer the grain required.

Data are available as to the proper grit size for a given radius. But there is considerable variation in the recommendations. Considering the number of grains available for cutting and the problem of wheel wear, it seems likely that a 0.004 to 0.005 in. radius is the practical limit for crush-formed contours other than threads on which large multi-ribbed wheels can be used.

Medium-grade wheels are most popular, and grades for surface grinders generally are softer than those for cylindrical machines. As the wheel is in contact with a flat surface, the chip is longer and grains become dull faster. Thus, grades on surface grinders run from *F* to *K*, with *H*, *I*, and *J* most popular, while on cylindrical machines grades *K* to *M* are most often selected. In general, within each group, the closer the tolerance, the harder the wheel required. And the harder and more dense the wheel, the greater the number of pieces per truing.

In truing, the wheel and the roll are brought into contact with both members at rest. The motor is started and the wheel or roll is fed steadily to full depth of form. Three or four full revolutions of the wheel then are enough to complete the truing operation. Rotation then should be stopped before the roll and wheel are separated. This reduces wear and helps to minimize the danger of slippage and consequent damage to the roll contour.

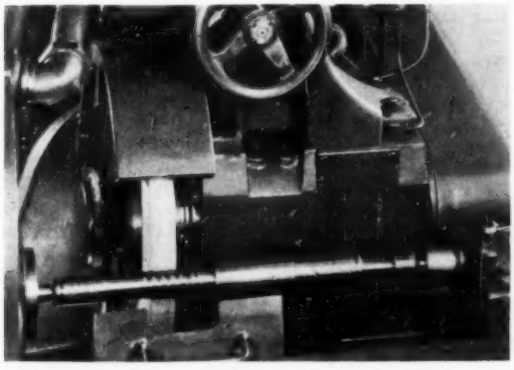


Self-shaping crushing device is intended for work requiring high accuracy. Rolls are soft and, when worn, are restored to shape by carbide form tool on slide. Motorized roll can be driven at shaving speed or crushing speed, or idled

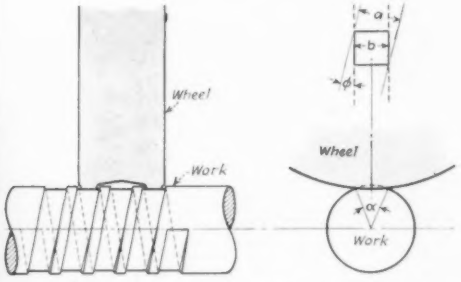
Crushing Speeds

Crushing speeds range from 100 to 300 sfpm. Slower than 100 sfpm is unduly wasteful of time. Higher than 300 has two disadvantages: it causes increased wear on the roll, and it results in crushing away more wheel than is necessary. In crushing, only 0.005 to 0.010 in. at most need be removed from the wheel, and the roll feed is from 0.0001 to 0.001 in. per wheel revolution. Thus, relatively few revolutions of the wheel are required and 300 sfpm is the top speed at which the process can be controlled adequately. Within the range, the actual speed is unimportant. The main point is to maintain constant speed during the operation, and to establish as nearly as possible a 1 to 1 ratio between wheel speed and roll speed.

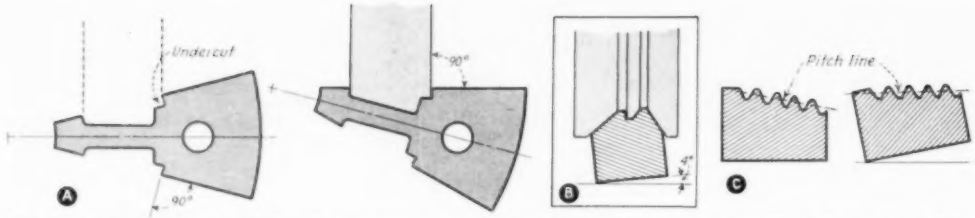
With a formed roll, of course, only part of the roll can operate at the same speed as the mating section of wheel. This is because of the difference in the peripheral speed of different outside diameters along the contour of the roll. *It is these differences in speed that account for the major wear on crushing rolls. And it is for this reason that roll life decreases as the depth of form increases.* It must be remembered that the speed differential between two mating contours is twice the difference in feet per minute between the form and the pitch line of the roll. This is because the large OD of the roll contacts the small OD of the wheel. Thus, the area of contact in crushing should be kept as near a pitch



Cylindrical wheel is crush-formed with two annular ribs and grinds left-hand helical oil groove in 1 pass in 18 sec. Groove consists of 4½ turns, 1/32 in. deep × ¼ in. wide × 0.375 in. lead. Machine is set for 0.375-in. lead, wheel is plunged to full depth, and part makes 2½ revolutions to complete operation. Special rib shape avoids interference



Annular ribs on wheel are spaced to twice lead of helical groove. Rib is narrower than groove to avoid helical interference when work moves at 0.375 ipr past wheel set at zero angle. Small radii at base of ribs remove burr from work. Lower diagram shows that rib is made narrower than groove by an amount equal to cosine of helix angle when centerline of wheel and work coincide. α is arc of contact, a is width of groove, b is required width of rib on wheel, and ϕ is helix angle



Tilt work for these reasons: (A) To get away from undercuts in form. Work should be tilted to an angle at which form presents no undercut and can be crush formed. (B) To avoid straight side walls. Tilting work so wall is not at right angle to wheel face results in less wear on roll. (C) To obtain a more even pitch line. This reduces the differential in speed between roll and wheel; roll life is increased, as speed difference is greatest cause of wear

line as possible. This often can be done by tilting the work beneath the wheel.

Tilting is also employed to avoid straight side walls and undercuts. Undercuts, of course, can be crushed in no other way. Straight side walls, on the other hand, can be crushed but roll wear is rapid. The sharp corners also break down quickly in grinding, with resultant high wheel wear and the need for frequent truing. Tilting alleviates this condition to some extent. If it is necessary to crush grind a straight-side form, however, the roll can be made up in segments so the area on which rapid wear occurs can be replaced without the need of an entirely new roll. Another trick that saves on roll cost is to grind two contours on one roll. This can be done with narrow forms.

The feed rate for crushing ranges from 0.0001 to 0.001 in. per revolution of wheel and depends upon such factors as the diameter and hardness of the wheel, the characteristics of the form, and the machine upon which the operation is performed. Hardness generally is the primary factor, but form may be limiting if a weak or fragile section is involved.

Fluids for Crushing

A grinding oil should be applied and this probably will be the grinding lubricant as oil has been found most satisfactory in grinding with crushed wheels. In truing, oil apparently reduces the crushing pressure required and minimizes the abrasion that occurs during roll-wheel contact. Longer roll life is the result. Where it is necessary to crush dry, reasonably satisfactory results can be obtained.

In every crushing setup, the roll must be kept clean. If particles of wheel and of metal pack in the roll contours, an imperfect form is produced in the wheel. To prevent packing, an air blast, a stiff brush, or a scraper should be employed. The air blast is satisfactory when the crushing is performed dry, but for wet crushing the brush or scraper is best. The brush is mounted in contact with the roll, while the scraper, made to the contour of the roll, is positioned not more than 0.001 in. from it. On most work, the brush gives good results but for deep contours the scraper is recommended.

A major problem in crushing is to avoid chipping and pitting of the grinding wheel. Chipping occurs at the wheel edges and generally can be eliminated by reducing the rate of infeed or by increasing the flow of crushing fluid. A greater volume of fluid also helps to prevent pitting, as this condition usually is caused by loose abrasive grains rolling between the wheel and the roll. An air blast, or a brush, or scraper, as previously described, are also helpful in preventing these troubles.

The initial crushing roll is produced by the methods, other than crushing, that are employed in the production of circular form tools. This roll then is used to shape a wheel for plunge grinding which in turn produces other crushing rolls at a fraction of the cost of the initial roll. These are for production work. The initial roll and wheel are held as special tools for the shaping of additional rolls as needed. Delays thus are avoided and cost is held to a minimum.

Acknowledgment

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Carborundum Co.
Cincinnati Milling Machine Co.
Covel Manufacturing Co.
Desmond-Stephan Mfg. Co.
Gardner Machine Co.
F. F. Gilmore & Co.
Heald Machine Co.
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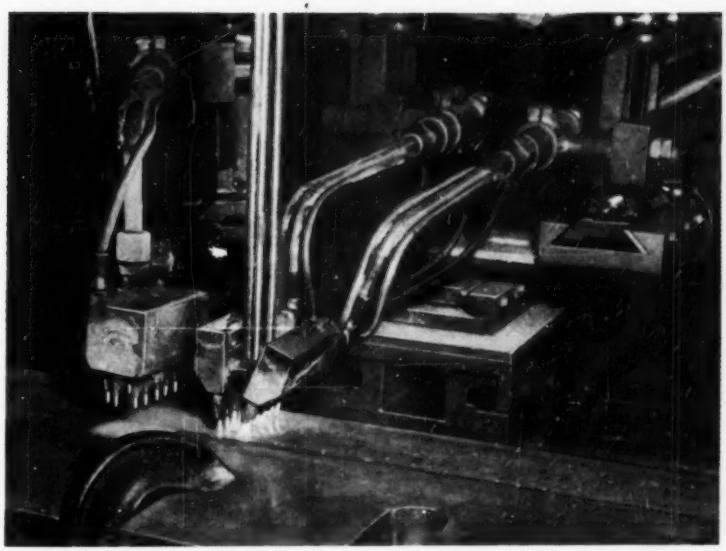
Ingersoll Milling Machine Co.
J. & S. Tool Co.
Jones & Lamson Machine Co.
Koebel Diamond Tool Co.
Landis Tool Co.
R. K. LeBlond Machine Tool Co.
Macklin Co.
Mattison Machine Works
Mid-West Abrasive Company
Moore Special Tool Co.
Norton Company
Oliver Instrument Co.
Pratt & Whitney, Div. N-B-P
Rivett Lathe & Grinder Inc.
Weldon Roberts Rubber Co.
Ross Mfg. Co.
Anton Smit & Co.
Simonds Abrasive Co.
Sheffield Corporation
Thompson Grinder Co.
United States Electrical Tool Co.
Vinco Corporation
Wheel Truing Tool Co.
Willey's Carbide Tool Co.



Adjustable holders on cross-slide of moving carriage for straight-line automatic hard-facing machine permit adjustment of multiple-flame heads to suit surface to be hard faced. Carriage travels on 12-ft track parallel with table on which work is clamped. Preheating and welding heads are separate so correct heat balance can easily be obtained

AUTOMATIC HARD FACING IMPROVES QUALITY, CUTS COSTS

Greater uniformity, reduced alloy consumption, less porosity, smoother deposits and lower machining time are obtained

BY ELDON C. HURT,
Welding Engineer, HAYNES STELLITE COMPANY

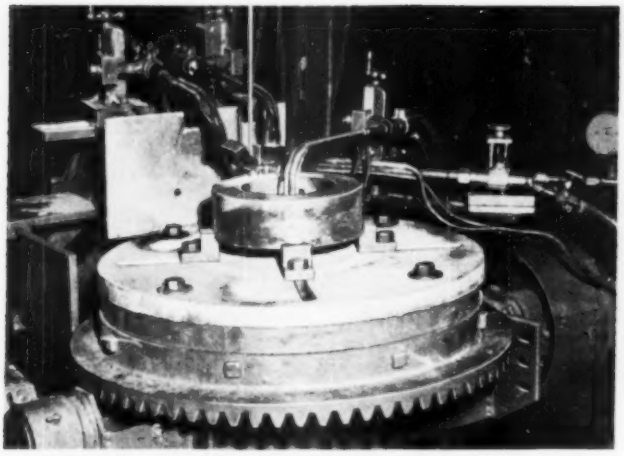
MECHANIZED automatic hard facing has been proved, by experimental work carried out at the Kokomo plant of Haynes Stellite Co., to be applicable to a wide range of work. Among the advantages of automatic, as compared with the usual hand torch hard-facing procedures, are: (1) costs are reduced, (2) the product is more uniform and can be made to conform more closely to specified requirements, and (3) there are fewer rejections because of pits and voids in the applied facings.

Basic conditions to be maintained for automatic hard surfacing include adequate preheat, proper proportioning of the welding flames, continuous supply of molten hard-facing metal, and adequate fluxing if a flux is needed. Heat balance also is an important factor. In an ideal heat balance, preheating should serve as a true preheat of the base metal, raising its temperature so that surfacing metal can flow onto it with only minimum assistance from the welding flames. The best type of preheat is that which produces a gradual temperature gradient throughout the workpiece.

Attaining a relatively low temperature gradient preheat is one of the most important points to be observed. Steep temperature gradients, attained by high heat input rates close to the welding station, frequently result in poor adhesion and porosity of the deposit.

Multiple small flames provide closer control, and aid in distributing the deposited metal evenly and smoothly. They also help to avoid overheating. In addition, small flames can be directed exactly where needed and do not create large volumes of ambient gases that do little more than heat up the apparatus.

Among the experimental machines now in use at the Kokomo plant is a straight-line automatic unit used for applying Stellite hard-facing materials to paper-pulp chipper knives, oil-expeller barrel bars, ensilage cutter knives, and ledger blades used in the cloth-cutting industry. This unit has a 12-ft track for moving the special multiple-flame welding heads



Hard-facing setup for gate valve seat ring employs four different heating heads. Preheat torches heat bore and OD while two heads are spaced on either side of gravity-feed rod support. Rings are furnace preheated to 900 F. About 1.3 lb of No. 6 Stellite is deposited in 20 min on 7-in. dia ring. Deposit is ⅛ in. deep, 1¼ in. wide

Welding positioner table is tilted to bring chamfered face of valve seat ring horizontal at hard-facing position. Two ¼-in. No. 6 Stellite rods are fed vertically through tubes to double-burner welding head. Preheat torch is supported just above constantly rotating table. Table is faced with ¾-in.-thick asbestos plate

along the work surface. Rods of the hard-facing material are gravity fed vertically through guides mounted on the welding heads.

Hard-facing conditions can be set up for almost any predetermined rate of production with this machine. The multiple-flame gravity-feed head is fixed with the flames directed to bring the base metal to the proper sweating temperature, and to melt the rod and distribute the molten metal to the desired points. After the gas flow has been adjusted to the rate of movement desirable for the particular parts, and the several tips have been directed to distribute the weld metal evenly, a uniform product is obtained with virtually no manual assistance. A slight oscillating movement of the welding head is beneficial, as compared to a straight deposit, where the distribution of the hard-facing material is dependent entirely upon the heat from the welding flames.

The oscillating gravity-feed hard-facing head developed for these operations can either be mounted on a traveling carriage and moved in a path parallel to the work, which is held in a fixed position, or the unit can be mounted in a fixed position while the work is moved in a parallel path.

Using the automatic straight-line machine, low-carbon-steel paper-pulp chipper knives are hard faced with No. 6 Stellite alloy in 16 min welding time. The alloy is made in ¼-in.-dia, 6-ft long rods, and three of these rods are fed vertically through guides in the oscillating head to produce a deposit 2 in. wide and 5/32 in. deep along the 24-in. length of the knife blank. About 2½ lb of alloy are used for each blank.

Facing Cutter Knives

Four ensilage cutter knives are hard faced in one continuous run with this same machine. The rod is gravity fed through a special four-flame welding head and the alloy is deposited at the rate of 7½ ipm. The deposit is laid along the edge of the blade 1/16 in. deep, 9/16 in. wide, and 20 in. long. Average time per blade is 3 min, and about 0.18 lb of alloy is deposited on each blade. To do this job manually would require 8 min, and 0.23 lb of alloy would be used.

A ledger blade, used in the cloth-cutting industry, is ⅝ in. thick, 3 11/16 in. wide, and 67 in. long. Using the straight-line machine with the oscillating gravity-feed method of application, a deposit ⅛ in. deep, 1¼ in. wide and 67 in. long is made. A total of 6¼ lb of Stellite alloy is deposited on the blade, and the entire operation takes only 80 min after setup.

Hard-face deposit accomplished with automatic equipment is smoother and easier to machine, and is less porous than hard facings deposited manually. Lip machined on inner periphery of chamfered face of ring helps keep molten hard-facing material in position until it cools and hardens

The basic principles of straight-line automatic surfacing can also be applied to the surfacing of other products when a relatively long, narrow surface is required. A typical operation is the surfacing of seat rings for large-diameter gate valves. The ring is mounted on the adjustable-speed turntable

of a conventional welding positioner equipped for power rotation of the table. Suitable multiple-flame heads are provided for preheating the area to be surfaced, for preheating the hard-facing rod, and for the hard-facing operation itself. Each head is mounted on an individual holder for multiple adjustments. This machine has been used satisfactorily for applying both Stellite and a special hard-facing bronze to the seating surfaces of valve rings ranging from 6 to 24 in. in dia. Deposited metal varies from ⅛ in. deep and ½ in. wide, to ¼ in. deep and 2 in. wide.

Recently it was found that improved performance could be obtained from this machine by replacing the mechanical rod feed with an oscillating gravity feed. Several large valve manufacturers are using modified machines of this type to hard face 24-in.-dia seat rings. These rings are 1¼ in. wide, 1¾ in. high and 24 in. in dia. The groove to be hard faced is ⅛ in. deep and ¾ in. wide. Average time for one ring is 30 min, and approximately 130 cu ft each of oxygen and acetylene are used. About 2½ lb of Stellite rod are consumed during the operation. When the same size rings were hard faced manually, one company scheduled production at four rings a day, and used 3¼ lb of rod, and 110 cu ft each of oxygen and acetylene on each ring. One company is also using the mechanized process for hard facing 24-in. split-disk companion parts to the rings and the seating surfaces of wedges for gate valves.

Facing Cylindrical Surfaces

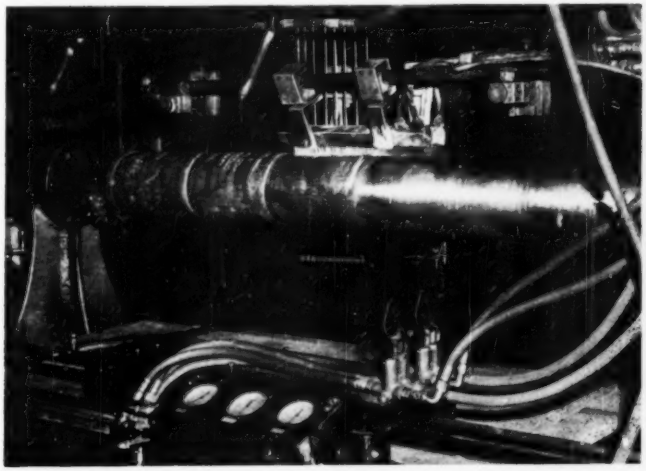
Cylindrical automatic hard facing is being used to an increased extent for cylinders used as pump rods, sleeves, bushings, collars and crushing rolls in the oil and food processing industries. In this setup the multiple-flame heating head is used to prepare the base metal properly for the hard facing metal, to obtain close control of the melting rate and to provide adequate control of the molten metal. This head has two parallel rows of converging heating flames, and between them a series of holes spaced about ⅜ in. apart for the full length of the work. These holes serve as guides for the rods. Each rod passes freely downward through one of the guides and between two converging flames that impinge against it just above the point of contact with the work. A sufficient number of rods and flames are provided to extend the full length of the work.

This close association of the rod with the flames gives a combination of rod preheat and welding flames that produces a relatively narrow weld zone. This is necessary because the molten puddle is maintained on the top of a rotating cylinder and the hard-facing metal must flow onto the base metal and solidify before the cylinder rotates far enough to permit it to run off. Little difficulty is encountered in this respect after the proper heat balance has been obtained to conform with work turning rate.

Machine Fully Adjustable

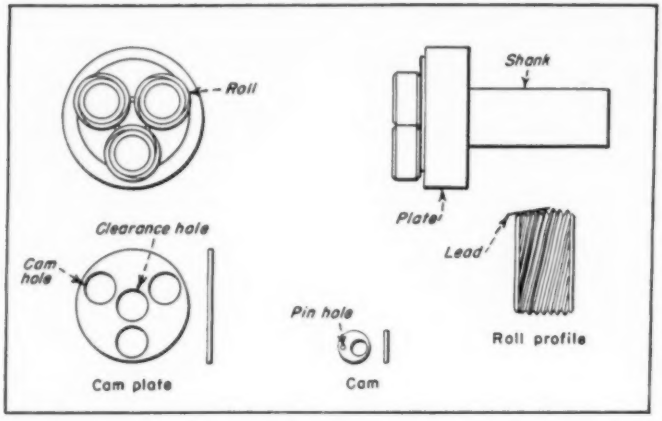
The cylindrical hard-facing machine can be adjusted for different sizes of work and for complete control of the progress of the operation, and this assures satisfactory consistency in the results. Each of the three sets of heating flames —the preheat set, and the two rows in the welding head—is supplied through a separate pair of oxygen and acetylene regulators. This permits a wide range in gas flow to each row of flames. Local changes necessitated by the presence of fillets or changes in sections are readily accommodated by changing the length and passage size of the individual tips associated with that section of the work. Further, means are provided for raising and lowering the main welding head, and also for transverse adjustments. The entire table supporting the rotating spindle may be oscillated lengthwise to overcome the furrows which sometimes develop on the surface between the individual rods. In these cases, the stroke of oscillation is equivalent to the spacing of the rods and serves only to level off the molten metal.

In some cases it has been found beneficial to remelt the deposit superficially by rotating the work another turn under the welding flames without adding additional metal. This remelting, accompanied by slight oscillation of the work, smooths out the little furrows and floats the last traces of scale and flux onto surface, leaving the deposit smooth and uniform.



Stainless steel pump plunger, 6¼ in. OD, is hard faced in 9-in.-long sections spaced 2 in. apart. Spaces are used as locating points for determining straightness for machining and are filled in by hand welding after rough machining cut has been taken on OD. A total of 50 lb of material is applied, and time is less than one-sixth of that required to do job manually

Practical Ideas



Lathe Rolling Attachment Forms Threads Continuously

EXTERNAL SCREW THREADS are rolled to any length that can be handled on a turret lathe by an attachment that employs three thread rolling rolls instead of one or two rolls and a back-up support. Because the tool works axially with the cylindrical part to be threaded, the rolls have full-depth threads near their back ends but only partial-depth threads near the front.

The device is built up on a hollow shank and a heavy round plate. Headed journal pins that hold the rolls are pressed into three holes equally spaced around the plate. Both plate and shank are slotted and fitted with adjustment screws so the rollers can be moved slightly for minor position corrections.

A small off-center cam is located behind each roll and is keyed to the roll by a pin. These work in a drilled cam plate which oscillates behind the rolls but in front of the support plate. As one roll is turned by the work it contacts, the others are rotated by the action of the cam plate on the other cams, which keeps all three rolls in synchronization. The original setup must be made with the pins located so the threads on the rolls correspond to produce a continuous thread on the work.

In a turret lathe, the workpiece is rotated by a chuck and the tool is fed by the turret. Support plate, cam plate, and hollow shank are all drilled to clear the work. In case the tool should be employed on a drillpress, the shank must be altered so it can be attached to a hollow drill spindle (to clear the work).

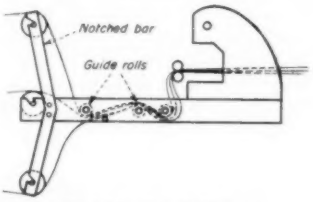
Although the cam arrangement will work well if it is well constructed, the synchronizing mechanism can be fitted with gearing, although this would be more expensive. An opening device to free the work from the rollers may be added, but it would probably be more practical to make a new tool for each size of work to be handled. *N. Bonamini, Glasgow, Scotland.*

Standardized Clamp Blocks Simplify Many Setups

THIS SIMPLE but useful wrinkle has been found to be a timesaver in many ways around the shop. In repair work, short runs, and in building dies, fixtures, and tools, large shim blocks, are often needed, and must be of a certain size to fit the job. A regular set of blocks of varying sizes can be made.

These should be made in sets of four each, and can be merely sawed from scrap stock. It is convenient to have blocks 1/32, 1/16, ⅛, and so on up to a thickness of 1½ in., if stock is available. The lengths and widths can be standardized at 1 in. and 1¾ in. At a corner of each block a ¼-in. hole can be drilled, the edges can be filed, thicknesses can be stamped on each block (both sides), and finally the blocks can be hung on a pegboard near the operator's machine or bench.

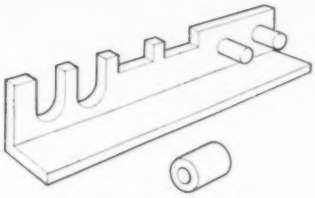
Now when a job has to be set up with strap clamps, the block of the necessary size can be selected immediately. The blocks can be employed for fastening down dies in a punch press, spacing work in a cutoff saw, setting stops for blind-hole drilling, supporting a punch when it is being fitted, and can act as parallels in small spaces. *Basil Clark, Evansville, Ind.*



Extra Guides Feed Three Rolls of Flat Stock

WHEN TWO or more rolls of stock can be cut at once by the same punch or shear, a triple feeding device will speed up production and save floor space.

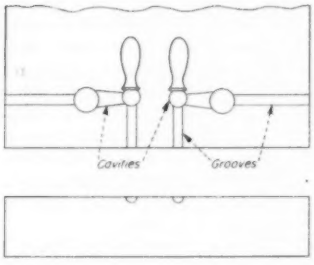
Two notched bars of steel can be added to each side of large guide channels so they will support stock rolls above and below the regular roll. With proper guide rolls, the three strips of stock can be fed together into the dies. *Mark N. Kert, New York, N. Y.*



Multi-Dimension Checker Speeds Inspection

ON JOBS that have a number of dimensions to be checked as they come from the machine or into a checking room, we are using a sort of combination affair which eliminates the handling of various gages and reduces the possibility of mistreatment and loss. The gage illustrated is used for checking small disks.

Two large notches on the left side of the large gage block are for checking high and low limits of the outside diameter. Two slots in the middle check the maximum and minimum lengths, and two pins at the right end of the gage check inside diameters. The advantage of such a gage is that all gaging surfaces are combined and one cannot be lost without losing all the others. *Charles A. Lauer, Fort Wayne, Ind.*

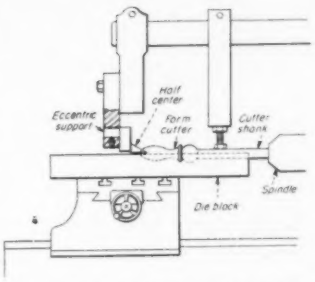


Form Cutter Mills Cavities In Die-Casting Blocks

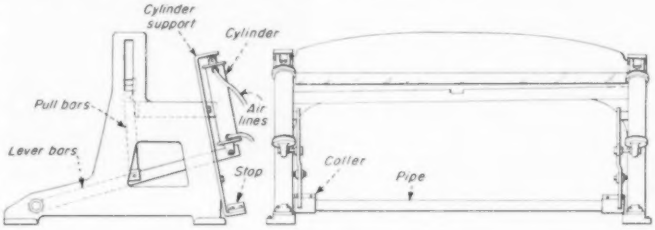
WE HAD to sink eight cavities into two die blocks to cast handles for machines. Two special form cutters were made to cut out half-cavities in each of the die blocks.

First the cavities were laid out on the blocks and half-inch grooves were milled with a round-end cutter from the edge of the blocks into the cavity layouts. Then the form cutter was mounted on the milling-machine spindle. This cutter had a long shank that fitted in the half-inch grooves and was held down by a leg support from the overarm. The other end of the cutter was centerdrilled, and was supported from the overarm by a half center that was mounted on an eccentric. The eccentric allowed adjusting the cutter up and down at one end.

Handle cavities were milled by raising the milling machine table with hand feed. When the die block butted against the half center, full depth was reached. The



cavities for the form-cutter shank were later filled in with drill rod which was screwed into place and milled off flush. This method saved a lot of time. *Fred H. Lingenfelder, Milwaukee, Wis.*



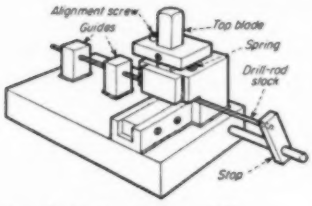
Air Cylinders Mechanize Old Manual Shear

MANUALLY-OPERATED machines can be converted to automatic operation by use of air cylinders, which provide relatively cheap power. An old foot-operated shear was fitted with two air cylinders which made shearing a lot easier.

Two flat iron strips were bent and bolted to the front of the shear, one at each end, to support the cylinders at their tops and to hold a braced rubber stop at the bottom. The old springs and weights were removed from the shear because the quick action of the air cylinders would not require them. The old blade pull bars at each end of the machine were bolted to the middle of lever bars that were connected at one end to the air cylinders and at the other end to a piece of pipe across the bottom of the machine. This pipe acted as a bearing shaft and also as a pivot. Both lever bars were welded to collars clamped on the pipe. Linkage at both ends of the air cylinders was by means of bolts.

A foot control valve was located in the middle of the shear and connected to both air cylinders. For most efficient operation, the air compressor should be close to the shear so little loss of volume and pressure will be encountered. The air reservoir should be large enough so the shear can be operated without overworking the compressor. Cylinder exhaust couplings should be large.

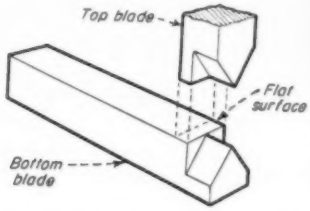
The size of the air cylinders necessary to operate the shear can be calculated by considering both piston areas, the average air pressure available, the mechanical advantage of the linkage, and the amount of force necessary to cut through the largest size of stock that will be handled. *Lowell F. Stull, Youngstown, O.*



Bench Cutter Snips Off Small Pins for Dies

SMALL PINS are cut from drill rod to act as punches in perforating dies. When these pins have diameters as small as 0.028 in., they cannot be easily cut off, either in diagonal cutters or in a shear. They have a tendency to bend instead of parting.

The illustrated cutting tool can be made in almost any size for different stock diameters. To cut



punches, run the stock through the guides to the stop and hit the vertical cutter with a hammer. The two sharpened blades will come together and will pinch off the the stock. Flattened surfaces on the cutting tools are left so the edges will not hit together and dull each other. *Elbert Jones, Eatonton, Ga.*

Steels Marked With Code

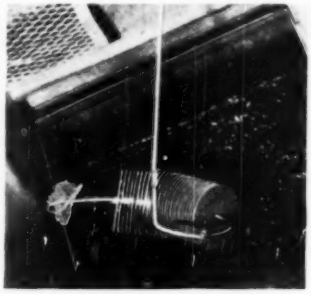
EXPERIMENTAL WORK calls for tools and fixtures that are not made from blueprints, and are often made by modifying older tools and jigs. The problem that confronts the hardening shop when one of these jobs comes in is to find out what kind of steel the item is made from.

We mark each job with a code number: K for Ketos, H for Halcomb, DR for drill rod, A for Airdi, AK for Airkool, and so on. Steel that cannot be hardened is not marked at all.

If the hardening room is the control point for this identification, little trouble will be encountered. *Alfred W. Gally, Madison, N.J.*

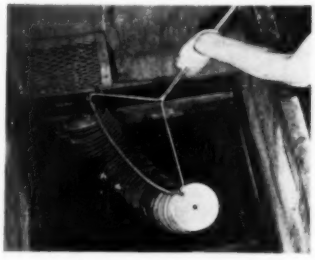
Degreasing Hook for Disks Replaced by Spring Support

SELENIUM RECTIFIERS were once degreased by threading a number of them onto a long, twisted hook, then dipped in the degreasing solution. However this method was not efficient. Spacers had to be thread-



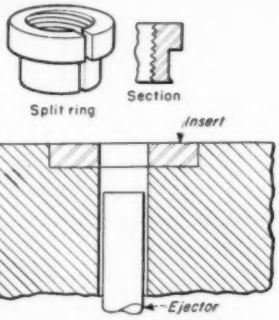
ed onto the hook between the rectifier disks, and had to be separated after the operation was finished. In addition, spacers dropped on the floor and presented a hazard if left there.

A new method employs an ordinary screen-door spring and no spacers at all. The aluminum disks



are simply fitted between loops in the spring, then the spring is attached to two prongs of a fork-end hook and dipping is continued. The blanks are released over a bin by stretching the spring.

Degreasing time was reduced by 20%, and a hazard was overcome. *Paul L. Newbury, Westinghouse Electric Corp., Buffalo, N.Y.*



Ring Releases Backing Plate

WHEN part of a cast-iron machine member is to receive repeated blows, a hardened insert is usually added to act as a backing plate. When an ejector is used at this spot the hole in the casting and the one in the plate are normally the same size. Without a modification of the member—such as knockout pins—the plate is difficult to remove.

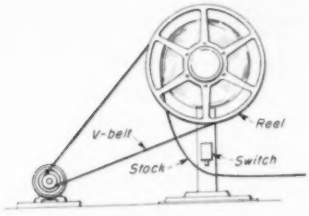
A split ring of tough steel can be cut to fit in the backing-plate hole, a standard pipe plug can be inserted and tightened, and the plate can be tapped and removed with the plug. Many parts with drilled centers can be removed in this manner. *Ray Cafiero, Brooklyn, N.Y.*

Cam Dwell Ground With Cam on Bent Shaft

MANY production machines have cams mounted on shafts that do not run true. When a cam on such a shaft must be reground for a different cycle or for a dwell, grinding the cam on a different arbor will not produce a true-running cam. The cam must be ground on the out-of-line shaft.

This can best be done with a toolpost grinder of the self-feeding type. The cam can be rotated through the dwell while the grinder is being operated. A post support or part of the machine frame can support the grinder, which should be fed into the work with light hammer blows.

We recently did this on a thread-rolling machine and the results were more than satisfactory. *Ray Cafiero, Brooklyn, N. Y.*



Motor Operates Stock Reel

WE NEEDED a motor-operated reel on an automatic stamping operation, but the cost was too high for our small shop. As a substitute, we rigged up a ¼-hp motor, a microswitch, a V-belt, brackets and wire.

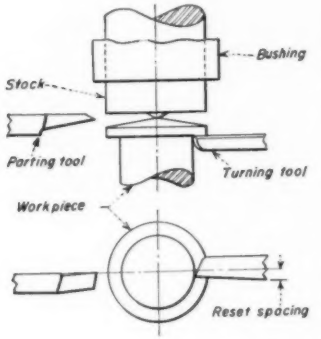
The motor was mounted on the floor and operated the reel through a small pulley, a V-belt and the hoop of the reel. The microswitch was located on a bracket where the stock would pass under it. When the stock was pulled through the stamping press and lost its slack, it touched the Microswitch and started the motor. As soon as the reel had let out some slack in the stock, the Microswitch was released, and snapped the motor off. *Bernard Levowich, Brookline, Mass.*

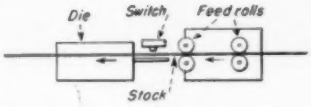
Reset Turning Tool Backs Up Parting-Tool Pressure

SEVERAL HUNDRED long, slender workpieces had to be turned from ⅛-in.-dia steel rod. This was done by supporting the work in a solid, hardened bushing fixed on the lathe saddle. The turning tool worked close to the bushing. The work was driven by a chuck in the lathe headstock.

The tool was set up cut downwards at the back of the work. Cutoff was handled by a V-shaped tool at the front of the work. This tool also formed the shape on the end of each part as it was cut off. Due to a slight working clearance of the rod in its bushing, trouble was experienced when the pressure of the parting tool forced the work against the turning tool which caused a turned undercut at the shoulder of the part.

A simple solution to the problem was to set the rear turning tool several thousandths above center height in relation to the work—or actually several thousandths below center, because the tool was inverted. The tool was ground to a more-than-normal rake angle and cut to size in the new position. Now when parting-tool pressure moves the work back, the rod rides up on the ground rake and no undercutting takes place. *Dan J. Penway, Cumberland, England.*

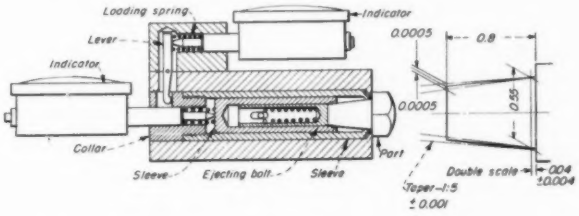




Safety Switch Cuts Off Press Feed

ON AN AUTOMATIC punch-press operation in our shop, it was necessary to have an operator available to shut off the press in case of trouble in the dies. When the dies jammed, the stock would no longer go through them, but the feed mechanism would continue to operate and would loop the stock up in front of the dies.

A simple method of preventing this was to incorporate a Microswitch into the motor circuit and locate it just past the feed rolls in front of the die. The switch was located close to the stock, and when the stock started looping up the switch lever would be depressed. This would stop both the press and the feed mechanism. *Bernard Levowich, Brookline, Mass.*

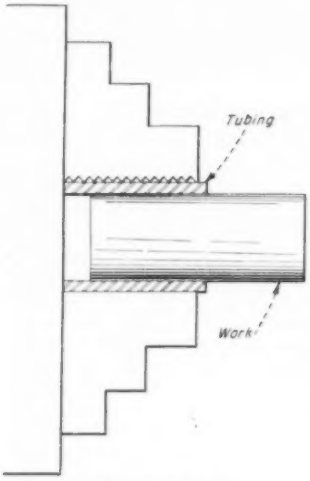


Double-Dial Fixture Gages Small Tapered Parts

SPEEDY TAPER INSPECTION can be done with a gaging fixture like the one illustrated. Both the diameter of the small tapered workpiece and the taper itself are checked at the same time. Limits for the round part are shown above right.

The workpiece is pressed by hand against the fixture body until the head touches the body and the shank forces back two gages. A sleeve that contacts the workpiece nearest its head operates a lever which depresses the top dial indicator. The lower indicator is worked directly through a second sleeve that contacts the workpiece near its smaller end. The indicators are calibrated so the top one will give a reading on the diameter of the piece, and the lower one will indicate whether or not the taper is correct.

Moving parts are spring-loaded. The workpiece has to be inserted against pressure of a spring-loaded ejector bolt which will throw the part out when it is released. *A. Vetsch, Steffisburg Station, Switzerland.*



Bored Tubing Grips Work In Inaccurate Chuck

WHEN WORK must be held accurately in a three- or four-jaw universal chuck that runs out of true, the difficulty can be remedied by the illustrated method. A piece of thin-walled tubing is first chucked in the lathe.

The jaws are tightened until the tubing is slightly out of round, then the tubing is bored out accurately so the work will slip fit into it. The work is then slipped into the tubing and the chuck jaws are tightened. The result will be more accurate than if shims or other time-wasting methods were employed.

If the jaws are tightened properly, no trouble will be encountered with the work slipping. *Roger Isetts, Kenosha, Wis.*

Scale Notched to Gage Screws

AN INEXPENSIVE 6-in steel scale can be slotted in the edge opposite the graduations so assorted screws and dowels can be gaged for size. The slots can be cut to standard widths from 3/16 to 5/8 in., which are the most popular sizes. Slot depth should be slightly more than half the width. Numbers to indicate the sizes (maximum limit) can be etched above each slot. *Roger Isetts, Kenosha, Wis.*

Tubing Bender Made From Pulley

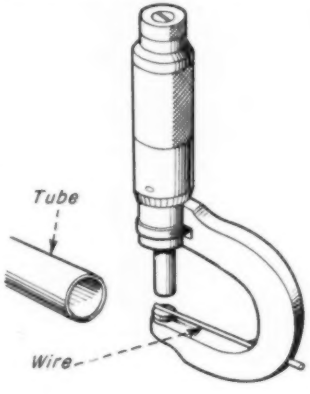
IF TUBING must be bent to different radii, a handy mandrel can be made by driving a short shaft into the bore of a 4-, 5- or 6-step V-cone pulley. The shaft is for clamping the pulley in a vise. V-grooves of different sizes allow bending to different radii while the sides of the groove support the tubing to prevent buckling or flattening. *Harry Nordstrom, Minneapolis, Minn.*

Adapted Internal Micrometer Measures Tubing Walls

HERE is a way to measure the thicknesses of metal tubing walls with a common 1-in. micrometer. A 0.040-in. wire of drill rod or music wire is placed across the fixed anvil of the micrometer.

To prevent this wire from shifting or falling off, it is forced through a 0.040-in. hole which is drilled to receive it in the frame of the micrometer. This should be a fairly tight fit but not so tight it cannot be removed. The drill size is standard.

The hole on the original micrometer was drilled with a 1/30-hp, 6000-rpm sensitive drillpress. The small wire size was chosen because it would not weaken the frame of the micrometer and because it will allow measuring small tubing. In addition, the small diameter allows bending the wire slightly when it happens to get out of line. *Paul Steiner, Waterbury, Conn.*



$25 *In addition to regular payment*

for the best PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER— Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER— Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N. Y.

90th Winner:

R. B. Wolverhampton

Scissor Bearing Extractor

NEWS OF METALWORKING

Machinists Ask Congress to Probe 'Plan' to Move Defense Plants Inland

WASHINGTON—"The program of military officers to uproot and move inland defense industries that are a major factor in the prosperity of almost every major city along the Atlantic and Pacific Coasts and in the Great Lakes areas—" is being viewed with alarm by the International Association of Machinists.

Despite repeated denials by the military that there is any such program, the union's executive council has issued a resolution calling upon Congress to investigate the "plans."

The union, in a two-page resolution, uses the migration of the Chance Vought Aircraft Div., United Aircraft Corp., from Connecticut to Texas, as the only example of the kind of thing it alleges the Pentagon is forcing. In a press conference on the resolution, Al Hayes, IAM president, also pointed to the recent reopening of the Boeing Aircraft Co.'s war-built Wichita, Kans. plant as another instance of the military conniving to move big industry inland. The point Mr. Hayes made was that the reopening of the Kansas plant caused the virtual close-down of the company's huge plant at Seattle, Wash., with a lay-off of 4,000 skilled workmen.

Transfer Hurt Connecticut, Claim

After pointing out that last year's Chance Vought transfer has "transformed a large part of Connecticut into one of the most severely depressed areas in the nation," the resolution adds the statement that "even greater hardship will result from gradual transferral of defense work away from plants in the coastal and Great Lakes areas as tens of thousands of experienced craftsmen are thrown out of work and private investors lose millions of dollars."

Asked about reasons for thinking that the Great Lakes are involved in the "plan," Mr. Hayes could only say that they had heard "rumors."

The "whereas" side of the resolution further points out that the "proposed relocation of defense industries will cost the government—and the taxpayers — additional millions of dollars to pay for recruiting, relocating, and retraining new teams of defense workers to replace those whose abilities have already been proved in wartime, and additional millions of dollars to pay for building or re-equipping government - owned plants."

Nothing is said about the costs of moving private plants and equipment, of disrupting transportation systems, or of the rights of industry to object to being overridden.

Would Cost Billions

When these costs are taken into account, the "millions" the union speaks of would have to be changed to "billions." Just where the money to pay for this program is coming—or would come — from is another thing the union fails to document.

The union president, when asked what he was advocating in the problem of industrial concentration and dispersing probable target centers of industry, said that he wasn't in favor of dispersing large concentrations of industry. His point was that bombers of any modern attacker could hit any spot in the country with little trouble, thus there is no necessity for moving industry away from anyplace. He said he wasn't arguing with the idea of dispersal, just the idea of changing the economic map of the country.

He admitted that he had asked Air Secretary Symington about the existence of a "plan" and was told there was no such thing.

Rural Area Big Market For Electrical Industry

ATLANTIC CITY, N. J.—With 78.2% of the nation's farms receiving central station electric service, the rural area has become one of the electrical industry's most important markets, according to M. E. Henning, chairman of the farm and rural market committee of the National Electrical Manufacturers Assn.

A break-down of 5-year business potentials includes $2 billion for electric appliances, $675 million for electrical farm production equipment, $865 million for electrical apparatus, and $300 million for wiring and wiring devices, Mr. Henning said.

He expressed his views with respect to the farm and rural market during the annual NEMA meeting here last month.

EMIL GAIRING, President, Gairing Tool Co., Detroit, was re-elected president of the Cutting Tool Manufacturers Assn. at the sixth annual membership meeting Dec. 6. All other officers were also re-elected

Metalworking Job Outlook Expected to Improve in '50

WASHINGTON — Downtrend of employment in metalworking machinery plants had not stopped in October, but the industry expected some improvement in the job situation in early 1950 due to replacement orders starting to come in.

That is what the U.S. Employment Service learned in a survey of more than 140 plants in the industry. USES found that:

Some 30 plants expect to hire additional workers. About 95 expect to maintain current employment. The others anticipate more layoffs.

In the third quarter of this year, jobs were down 18% below the 1948 average, 16% below 1941.

Employment drop in machine tools was worse than in other parts of metalworking machinery. It dropped 4.6% from August to October.

Bending, pressing and forging machine builders fared better. Their drop was only 1½%.

The drop in machine tool accessory and machinist precision tools was 3%.

150 Miles to Gallon Is Possible, SAE Says

NEW YORK—Is it possible to drive an automobile 150 miles on one gallon of gasoline?

Yes, the SAE says, and will tell how at the 1950 annual meeting of the Society of Automotive Engineers Jan. 9-13 in Hotel Book-Cadillac, Detroit.

The paper on development of fuel economy for automobiles is one of 40 technical studies to be presented at the meeting on such other subjects as functional body design, air conditioning, improved brakes, the application to agriculture of high-speed tractors, airplanes, and helicopters; progress in developing automatic transmissions; use of jet and turboprop powerplants in planes; prediction of road performance in commercial motor vehicles.

Among features of the meeting will be the address, on Jan. 11, of General J. Lawton Collins, Chief of Staff, U. S. Army. The SAE Horning Memorial Medal will be presented to T. A. Boyd of Research Laboratories Div., General Motors Corp., Detroit, for research in mutual adaptation of fuels and engines.

No Upsetting Strikes is 1950 Labor Outlook; Good Business Forseen

WASHINGTON—1. Labor peace and good business is what Washington looks for through 1950.

2. Except for raising the Social Security benefits, Congress won't pass any major legislation of interest to organized labor.

3. Absence of big labor issues will be welcomed by labor leaders. It will give them more time to concentrate on the political campaign next fall.

Those are the highlights of what you can expect on the labor front next year.

No Big Strikes Expected

Once the coal industry settles with John L. Lewis, there should be no upsetting strikes for the rest of the year. The union contracts in steel and at Ford run until next January. A strike is possible, of course, at General Motors, when the contract expires June 1. Or in electrical manufacturing once the union jurisdictional fight is settled. But they are not likely to occur if the companies go along with the pension and social insurance pattern of the auto and steel industries.

Government employment experts see a high level of production and employment ahead, but they also visualize a slow, gradual rise in unemployment. The reason: improved productivity and inability to absorb the 600,000 annual addition to the labor force.

In such a situation, it's expected that more older workers will be displaced and will have a harder time getting another job. This would raise the duration of unemployment, which is one reason why the administration will try to get all states to increase the duration of their jobless paychecks to at least 26 weeks a year.

The Senate will consider the Social Security amendments just passed by the House and is likely to adopt most of them. It may not accept the House provision for disability benefits, but the Senate certainly will broaden the taxable wage base above $3,000 a year and increase the monthly retirement benefit, which now averages $26.

The House bill would raise the benefit an average of 70% and fix a minimum benefit around $50. The Social Security tax paid by employer and worker will be 1½% instead of 1%, beginning Jan. 1.

The new 75-cent minimum wage and higher salaries for administrative, executive and professional employees who are exempt from the wage-hour law go into effect Jan. 25.

Taft-Hartley Election Issue

Congress will not tinker with the Taft-Hartley law. Instead, it will remain as an issue in the Congressional elections.

Labor's political machines will run full speed in an effort to elect a few more friends to Congress and save the ones already there. This is necessary to get the few more votes needed to put over a major revision of Taft-Hartley in 1951. Outright repeal is not in the cards.

Toughest hurdle the labor politicians must overcome is the trend against labor domination in the off-year elections, such as happened in 1946 when the Republicans took over Congress and passed the Taft-Hartley law. The fight will be concentrated in about 166 districts and in a half-dozen senatorial races.

Accent on Style in All Lines of Chrysler Corporation's 1950 Cars

DETROIT—Fifty thousand of its 1950 line of new cars—Plymouths, Dodges, DeSotos and Chryslers—will have been built by Chrysler Corp. before the end of December, said K. T. Keller, president, at a press preview Dec. 15.

Within one week after the start of new model production, operations had attained 50% of capacity which now is in excess of 7100 cars and trucks a day. Prewar capacity was 6000 units daily. Chrysler now has 5 million more sq ft of floor space than in 1941. Supply of materials is the limiting factor on current assemblies.

Public introduction of the new models will take place in the early part of January and will be by divisions.

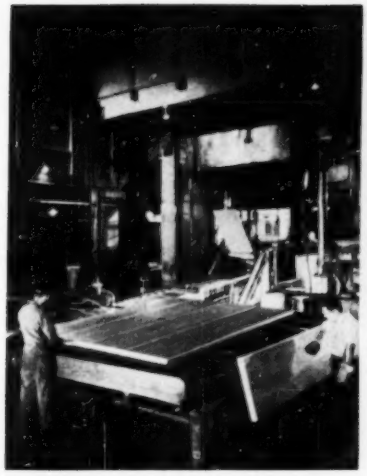
Each of the four lines of passenger cars has been given individual characteristics that make it easy to distinguish one from another. Some of the features:

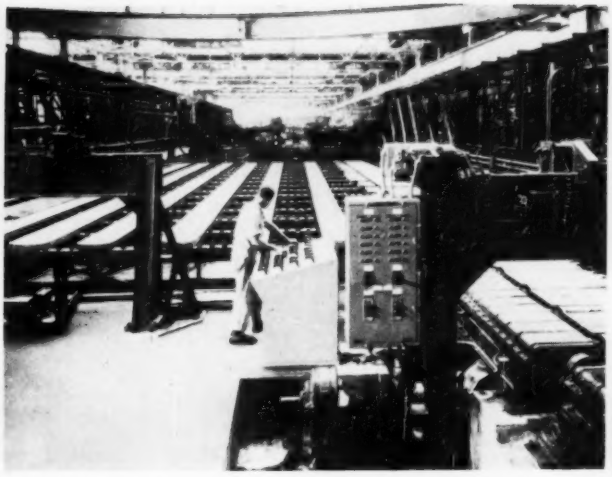
Plymouth—A longer, lower, more steramlined appearnce. Larger rear window on club coupes and four-door sedans. Greater over-all width. Grille simplified and made more massive. Rear tread increased 2½ in. The 6-cylinder 97 hp engine has a 7:1 compression ratio.

Dodge—Ten body styles, including one entirely new model, the Diplomat. Seating six, it has low sporty lines of a convertible but with a permanent steel roof. New heavy-duty, parallel bar-type grille of separate piece construction, and new large bumper guards, are among the improvements. Fluid drive is standard on all models.

DeSoto—Features a new, larger brake, 12 in. dia, requiring far less pedal pressure, with greater reserve and more brake lining contact. Rear wheel tread is now 2 9/16 in. wider, giving added stability. The Sportsman, a hard-top convertible has been added to the line. Other changes include longer peak-crowned rear fenders and deeper, wider, more protective rear bumper.

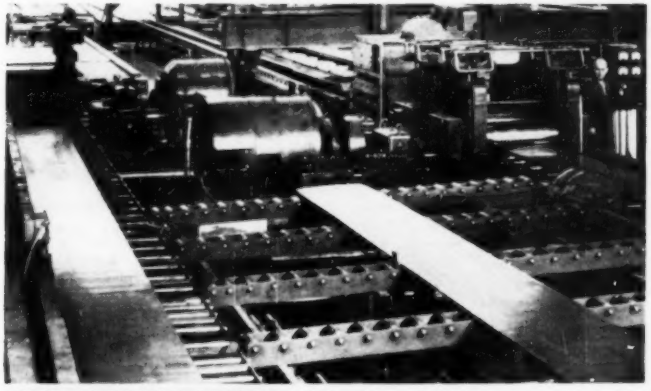
Chrysler—Six cylinder model also has larger brakes, and the eights have an improved booster on the brakes. Slight increase in exterior width, length and height. Interior dimensions remain unchanged. The Newport is new model—known as a special club coupe but in effect is a hard-top convertible.

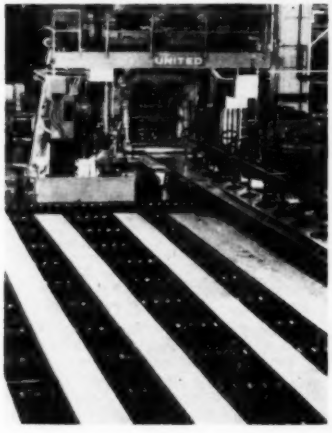




2000-lb brass bars leave the casting machine . . . They emerge from pushbutton-control mill as heaviest non-welded brass coils ever made

Scovill Opens $10 Million Continuous Brass Strip Mill





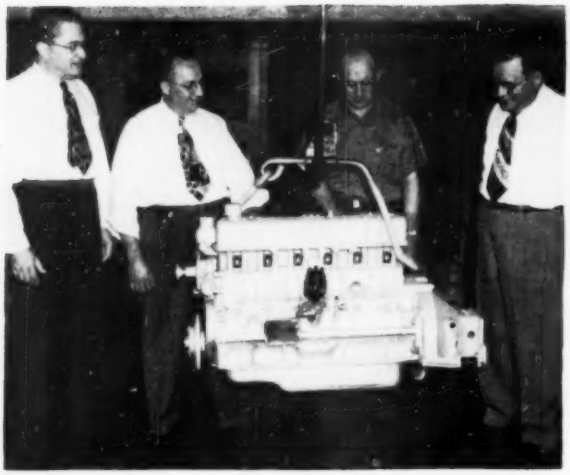
Above—Both sides of bar made smooth in passing through surface milling machine
Left—4-high cold run-down mill rolls 3/8 in. bars down to coils .050 in. thick
Below—Coil and bar annealing furnace has capacity of 33,000 lb of metal per hr

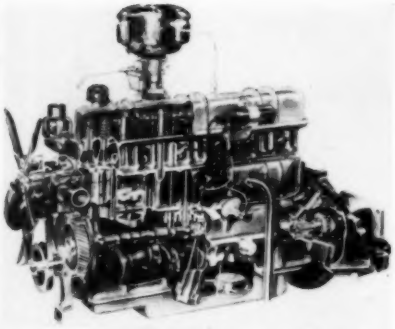
WATERBURY, Conn.—Scovill Mfg. Co. has placed in operation here a $10 million continuous brass strip mill, geared to a new flat-metal continuous casting machine that turns out 2000-lb brass bars.

Metal to be cast is melted in three electric induction furnaces, each with a capacity of 10,000 lb per hr. At staggered 30-minute intervals, each furnace discharges into a 9000-lb capacity holding furnace mounted over the casting machine. As the brass emerges from the casting machine, it is automatically sawed into bars of uniform length.

Automaticity is introduced everywhere in the mill. Vacuum cup and roller conveyor handling equipment help in virtual elimination of damage to the metal.

The old casting equipment handled 200 lb bars. With the new machine, savings of 30% are anticipated, the company stated. This saving eventually will be reflected in end prices, it was added.





All parts of the 220- and 240-cu in. displacement Silver Diamond truck engines are interchangeable, except crankshaft. Engines have 6.5:1 compression ratio. First engine off the line was inspected by R. R. Coulette, asst. wks. mgr.; A. M. Bowers, wks. mgr.; Maurice Bock, pres. Local 98, UAW-CIO, representing production and maintenance employees, and R. T. Rudolphson, gen. supt.

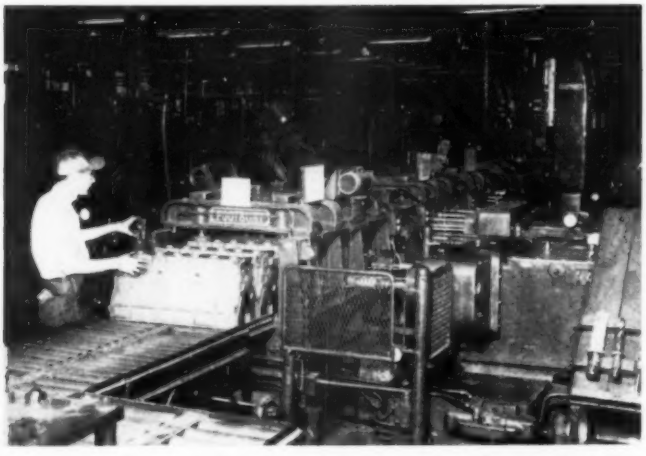
Harvester Uses Transfer Machines in New

INDIANAPOLIS—To minimize handling of parts between operations, International Harvester Co. included 17 transfer-type machines and five 6-spindle gear hobbers in its 400-machine, $4 million tooling program for the Indianapolis Works. Major changes in plant layout were required to insure lowest possible production costs for three models of gasoline truck engines, one of which is a new design.

New production lines were set up for the Silver Diamond engine, and minor changes made for Blue and Red Diamond engines. In planning the new layouts, engineers found it necessary to move virtually all existing equipment to new locations to make room for the new Silver Diamond engine. But the result is a well-integrated production plan whereby all lines deliver finished parts at points convenient to use in the new 70,000 sq ft assembly bay.

The changeover program got under way early in 1948, and was completed in time to supply Silver Diamond engines for the company's new L-line trucks recently announced. When one of the old machine lines was to be moved out of the plant, sufficient banks of processed parts were built up to sustain final assembly and service-parts requirements. And service parts equipment for the Green Diamond engines were moved to the new East Works at Springfield, Ohio.

In the new layout at Indianapolis, shop truck runs are kept short. And each machining line is balanced as nearly as possible with projected assembly requirements.

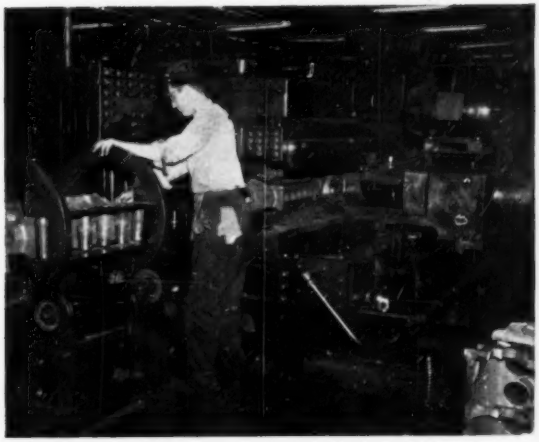


Crankcases are processed on two Footburt transfer machines. First unit drills, chamfers and taps all holes in both ends of the casting; second machine drills bottom surface and two sides

More Time to Inspect Parts

Use of horizontal in-line transfer type processing machines has proven especially advantageous in the two lines machining crankcase and cylinder head castings for the Silver Diamond engines. Ordinary handling of castings along conveyors has been minimized as compared to handling necessary in the machining lines for Super Blue and Super Red Diamond crankcase and cylinder head castings. Machine operators now have more time to inspect parts finished by their units, and to preset replacement cutting tools. They have less physical work to do and so are more alert to notice changes in machining conditions which might result in lower quality at the end of the line.

An important innovation in the Silver Diamond crankcase and cylinder head machining lines is the provision near the end of each major



Called the "Battleship" by the shop, this 70-ft. Ingersoll transfer unit rough mills top and bottom of crankcase, semi-finishes the top, finishes the bottom and bearing-cap surfaces, broaches surface width

Six-station Ingersoll rough bores six cylinders, mills main bearing seats to width and face mills a number of accessory pads and bosses

Engine Plant

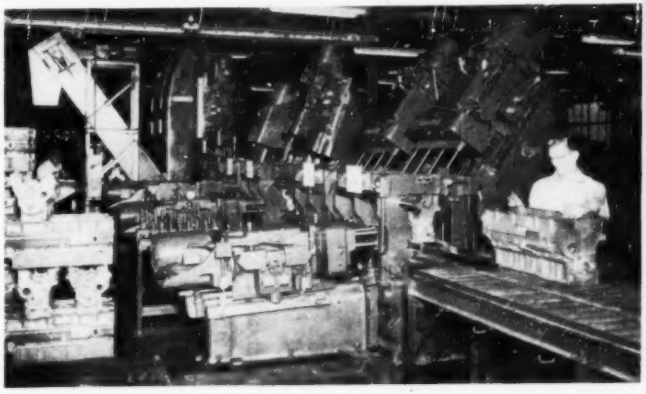
unit of floorspace areas for building up banks of machined castings. This bank of parts then becomes available for use by the next machine in line when one of the units is shut down for tool changes or maintenance. Banks are replenished when machines ahead in the line are shut down. Overhead hoists are provided for moving castings to and from the bank stockpiles.

Valve-in-Head Design

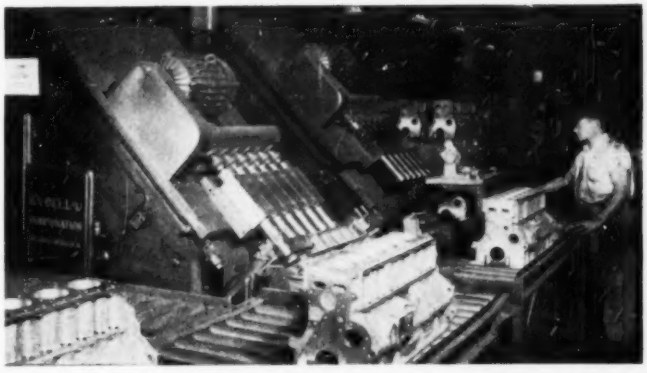
All three lines of engines now made at Indianapolis are of valve-in-head design. The new Silver Diamond engine is made in two sizes, with 220.5 cu in. (101.5 hp at 3600 rpm) and 240.3 cu in. (108 hp at 3600 rpm) displacements, respectively. Both sizes have a 6.5 compression ratio, compared with 6.3 for the superseded Green Diamond models. These six cylinder engines have all parts interchangeable, except for crankshafts, which have 3.683 and 4.018 in. strokes, respectively. This simplified the selection and installation of production equipment materially.

Engines in One Size

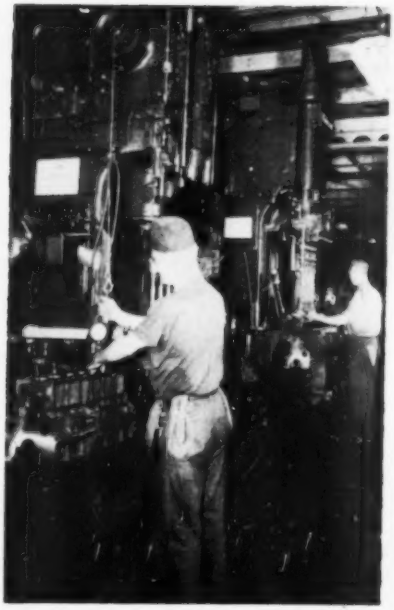
Improved Super Blue Diamond engines are made in one size, 269 cu in. displacement and developing 100.5 brake hp at 3000 rpm. Three sizes of the Super Red Diamond engine now are being made. They have 372, 406 and 450 cu in. displacements, and develop 143.8 hp at 3200 rpm, 154 hp at 3200 rpm, and 162 hp at 2800 rpm, respectively. Compression ratio for these six-cylinder engines is 6.3.



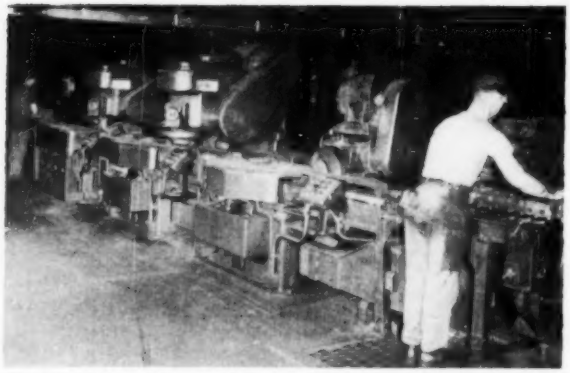
Bank of crankcases finished by Footburt (for drilling bottom surface and two sides) insures continuity of production further on



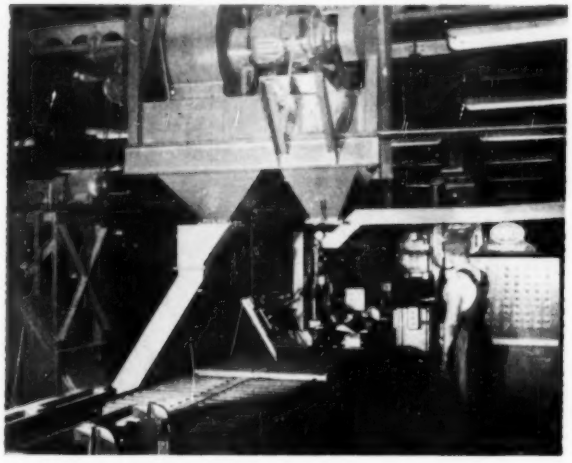
Cylinder bores are held to ± 0.0005 in. of specified mean size by two pairs of special Ex-Cell-O machines with automatic fixtures



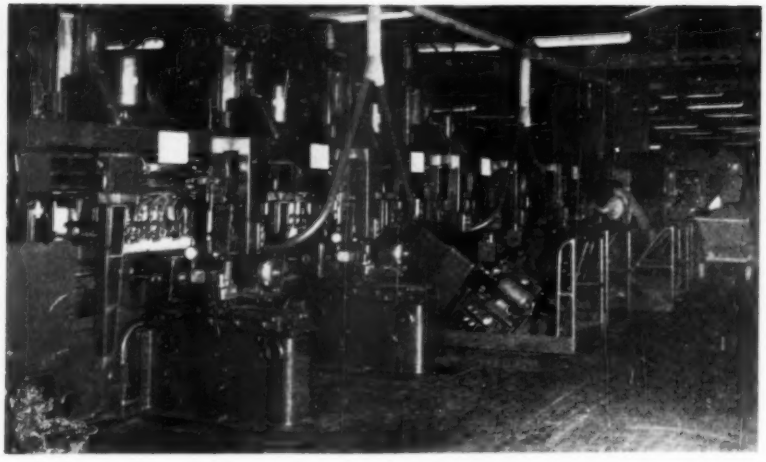
Honed cylinder bores, as produced on two special Barnsdrill vertical machines, are checked with P&W Air-O-Limit plug gage. First honing operation leaves only 0.0003-0.0004 in. in bore for removal in final "plateau" honing operation, a polishing step, at left



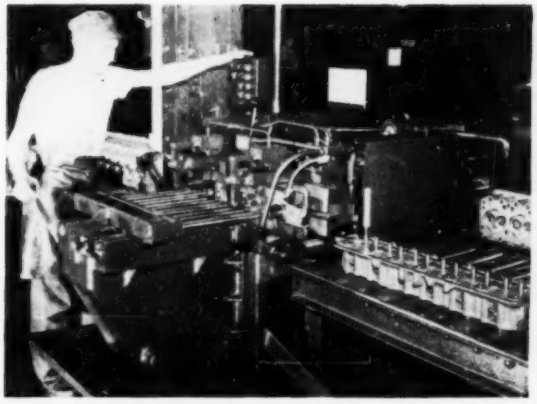
Cylinder heads are milled on top, bottom and both sides at high speed with carbide cutters. A three-station Sundstrand transfer mill is used for this operation



Overhead suction chip conveyor ahead of Natco 15-station machine has pickup tubes leading to the horizontal and vertical multiple-spindle heads that drill, ream, chamfer and tap the cylinder-head castings. This is the second Natco in the line, the first being an 11-station machine that does preliminary drilling and counterboring

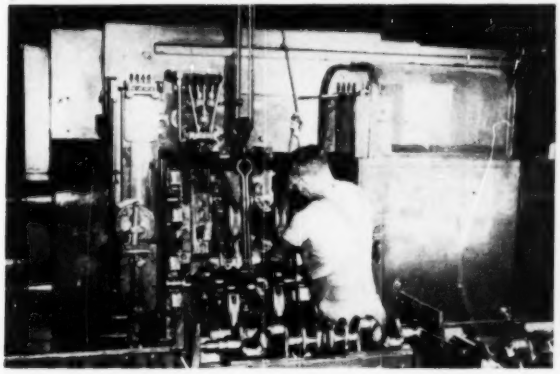


Operator's station at Natco 15-station unit for cylinder-head operations has signal station to indicate operating conditions at each head. Thus, he need make only an occasional tour to check operating conditions of 60-ft. machine

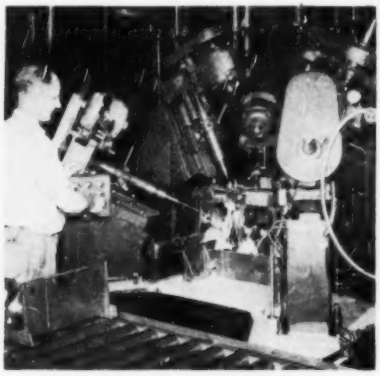


Twelve valve-guide bushings are pressed into the cylinder head, then broached and burnished in this special Oilgear machine. Automatic broach handling devices are supplied

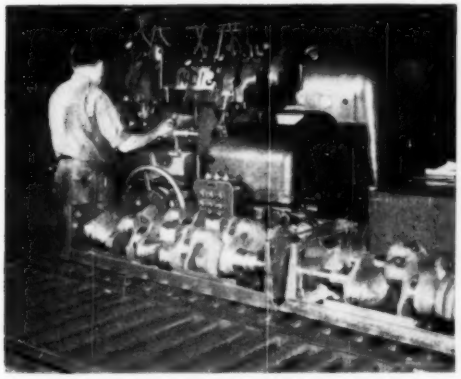
Valve seats are finished in Hall six-spindle grinders. Fixture indexes 180 after intake seats are ground to finish the exhaust seats



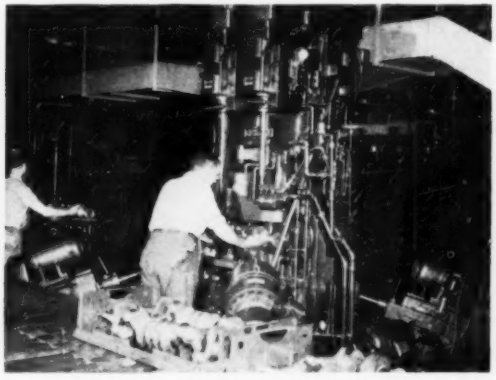
Crankshafts in two sizes have main and pin bearings rough and finish turned, the cheeks faced, and both ends turned in a battery of 12 LeBlond automatic crankshaft lathes



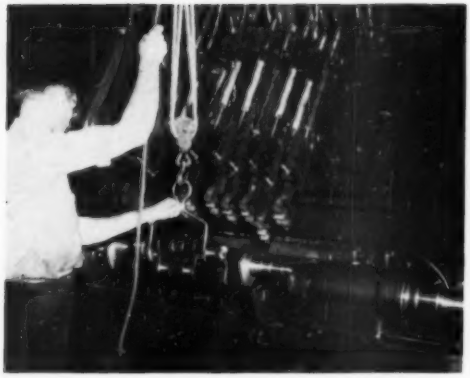
Oil holes from crankpins to main journals are drilled on Krueger special six-spindle machines. Pans on conveyor prevent work damage by proper separation



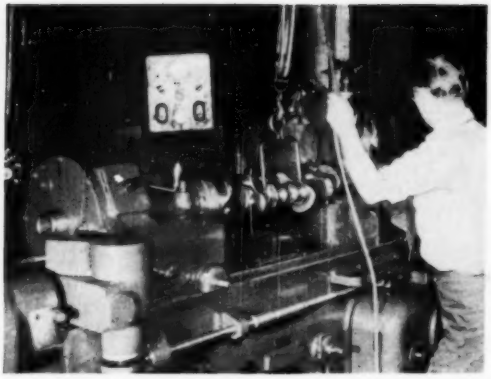
Five surfaces on crankshaft are ground by Landis unit, in which a single diamond dresses all wheels



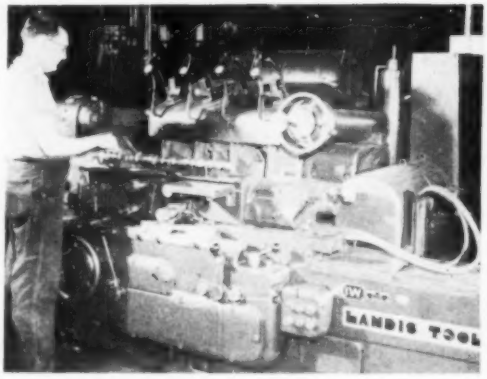
Static and dynamic balance of crankshafts is produced with a Gisholt Dynetric unit, which checks and corrects



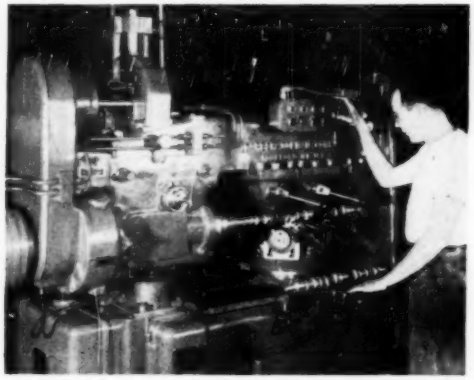
All running surfaces of crankshaft, except thrust walls at No. 3 main bearing, are Superfinished. The operation checks preceding operations on pin and main journals



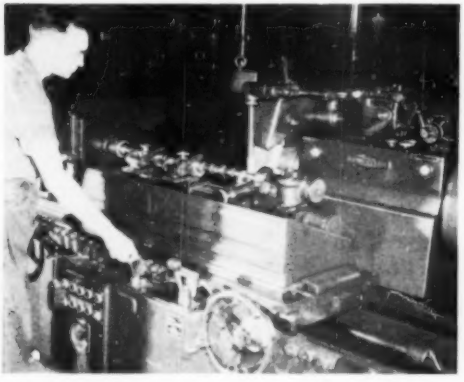
Starting nut thread on the end of the crankshaft is plunge ground on this J&L thread grinder. The machine is placed at the end of the crankshaft line



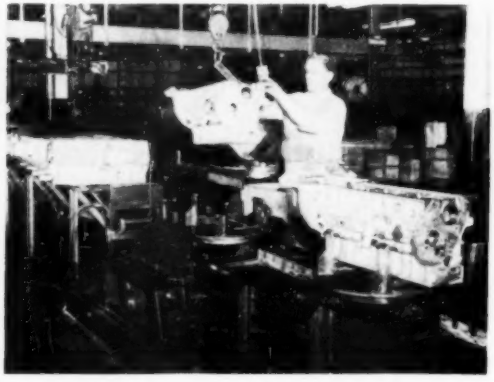
Four main bearings and gear blank on unhardened camshaft are rough ground simultaneously on a Landis grinder. Another unit finishes the bearings



Helical gear at center of the camshaft is cut in one cycle on a Barber-Colman Type A hobber. Steady rests support the shaft at second and third main bearings



Lobes on camshafts are rough and finish ground on Norton Cam-O-Matic grinders. Gradual reduction of workpiece speed during cycle is machine feature



Rotatable assembly fixtures on engine-assembly conveyor permit crankcase to be positioned vertically or set on its side, according to needs of operators in placing engine details in position

Full Patent Protection for German Industry Expected to Aid Recovery

MUNICH (McGraw-Hill World News)—Foreign firms and individuals can now get squared away with Germany on the status of patents, trademarks and copyrights interrupted or impaired by the war. Action on foreign claims has been made possible by establishment here of a German Federal Patent Office.

Legislation adopted by the Allied High Commission on restitution of foreign rights makes it the responsibility of the individual to file claim prior to October 3, 1950.

Main objectives of the legislation are: 1. reinstatement of patent and trademark applications which were pending at the start of the war; 2. restoration of rights seized or invalidated by Germany during the war; 3. extension of duration of patents, trademarks and copyrights for period corresponding to date war opened between Germany and country concerned and Oct. 1, 1949; 4. extension of time for claiming in Germany the priority rights accorded by International Convention for Protection of Industry Property; 5. authorization to Germans to continue to exercise under non-exclusive license, rights acquired bona fide during the war; and, 6. preservation of right of allied owner to institute proceedings within two years against Germans who infringed his right during war.

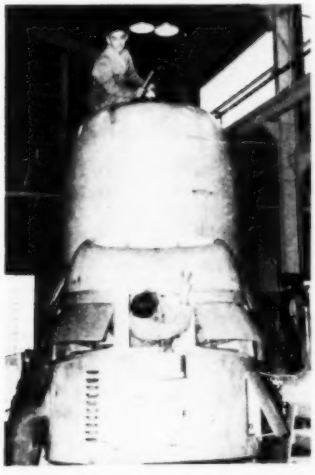
Restoration of full patent protection to German industry removes what has been a thorn in the side of German recovery effort for most of the occupation. Studies indicate that a 5% to 10% increase in western Germany's exports reasonably can be expected to result.

While a final disposition of Germany's pre-war patents seized by nations at war with her was made under the London Accord of 1947, no similar action has been taken on seized trademarks. Uncertainty over the status of these marks is a serious handicap in certain export categories. Failure to regain well-known marks can mean permanent loss of markets. And, some industries are unable to bear the expense of promoting new marks.

New business is brisk at the new patent office, with an average of 300 applications coming in daily. The construction industry, now booming with rehabilitation projects, is accounting for an uncommon number of patent applications.

The legal effect of patents and trademarks registered at Munich doesn't now extend to Berlin and eastern Germany. A branch is planned in Berlin to afford the same patent protection in the western sectors of the city as obtains in the western provinces. A Berlin office also would make it easier for German firms in eastern Germany to avail themselves of the protection of the new office.

The Soviet puppet regime in the east zone is expected to counter with a patent office of its own.



***THIS JIG** was devised at Pan American's San Francisco maintenance base for overhauling Stratocruiser 3500 hp P&W engines. They claim the vertical position facilitates work, offers greater protection to engine and accessories, and cuts man-hours.*

Machine Tool Reparations Boon to N. Z. Industry

WELLINGTON (McGraw-Hill World News)—The value of tools and equipment allocated to New Zealand by the Inter-Allied Reparation Agency to date totals £247,000 stg. Of this amount £135,000 worth of equipment was delivered in 1948-49, bringing total deliveries to £175,294 on IARA valuation.

Equipment delivered and disposed of includes 222 lathes, 193 drilling machines, 130 presses, 97 grinding machines, 79 milling machines, 64 sawing and slotting machines and 45 planers and shapers, a total of 830 units.

Of these, 341 have been allocated to government departments and the balance to private bidders. There were also 121 items of miscellaneous equipment, comprising electric motors, centrifugal pumps, air compressors and testing apparatus, of which forty-seven were taken up by government departments and seventy-four acquired by private industrial establishments.

There is a sustained demand for machine tools from both government departments and private industry and those already disposed of have been put to good use in both maintenance and production. All tools were supplied under the German reparations account.

Indian Machine Tool Makers Bitter Over Lack of Government Support

BOMBAY (McGraw-Hill World News)—Indian machine tool manufacturers are growing increasingly bitter over the lack of government support for their activities, and the resultant drop in their sales.

There still has been no action on the Indian Tariff Board's three-year-old proposal that official support be given by stipulating the purchase of Grade I Indian-made machine tools for government factories and workshops, although the idea was accepted in principle long ago.

Meanwhile, the Open General Import license revoked at mid-year resulted in such a flood of imported machine tools that it is estimated they will not be disposed of within two years at the present laggard pace of Indian industrialization. The immediate result is that Indian manufacturers are not able to clear their stocks. The Indian Machine Tool Manufacturers' Association estimates that some firms have up to 50% of their paid-up capital locked up in unsaleable stock.

Meanwhile, the announcement of the Indian government contract with Oerlikons for construction of a state-owned machine tool plant has been a fresh blow. To be sure, even the first phase of production is not slated at that works until 1952-53. But established manufacturers are afraid that the new project will be a strong competitor for the labor force they have trained and that potential machine tool purchasers may alter their requirements and delay their orders until the new state factory opens.

Total sales of Indian manufacturers in 1949 will run to only $630,000, compared with $1,050,000 in 1948.

France to Buy $10 Million In American Machinery

WASHINGTON—A wide variety of French industries will benefit from Marshall Plan shipments of modern American machinery going to France under a single purchase approval announced by ECA.

The ECA procurement authorization provides France with $10,164,000 to buy industrial machinery in the U.S. ECA officials said that the industrial machinery commodity group covers a wide range of capital goods equipment for factories.

In requesting this purchase approval, French officials listed French industries needing the modern American machinery to increase efficiency and production in their plants. They include the gas, nitrogen, glass, textile, sugar refining, heavy electrical, and wire and cable industries. The ECA procurement authorization also covers miscellaneous public works equipment.

Contracts under the new purchase approval should be completed by May 31, 1950, ECA said. Delivery of the machinery should be made by Feb. 29, 1952.

West Coast Short on Parts Makers To Supply Assembly Plants There

LOS ANGELES—While local purchases by automobile assembly plants in California have increased since the war, there are still a good number of accessories which would be bought in the West if there were local producers. But there aren't—not for tail pipe extensions, mufflers, gas tanks, wheel discs and hub caps. Neither are there western manufacturers of a lot more parts which go into Los Angeles and San Francisco Bay area assembly plants as this survey shows:

Last year the General Motors Parts Div., Van Nuys, spent about $40,000,000 locally on parts for the Oakland and Van Nuys Chevrolet assembly plants and the South Gate Buick-Olds-Pontiac plant. Purchased were wheels, bolts, bumpers, cushion and chassis springs and rubber parts. The plant would buy tail pipe extensions, mufflers, gas tanks, wheel discs and hub caps locally if a producer were available.

Main California suppliers are U.S. Spring & Bumper Co., springs; Norris Stamping & Mfg. Co., bumpers; Douglas Aircraft, gravel guards and dust shields; Russell, Burdsall & Ward Bolt & Nut Co. and Russell Bolt & Mfg. Co., bolts.

Fred Rumball, Ford Motor Co.'s manager of West Coast purchasing, says his company's Long Beach, Maywood and Richmond plants spent "better than $50 million locally" in '48.

Ford buys stampings from General Machine Works, interior die castings from Cannon Electric Development Co., and outside body molding from Western Moulding Co., also using some of the GMC suppliers.

No West Coast Preference

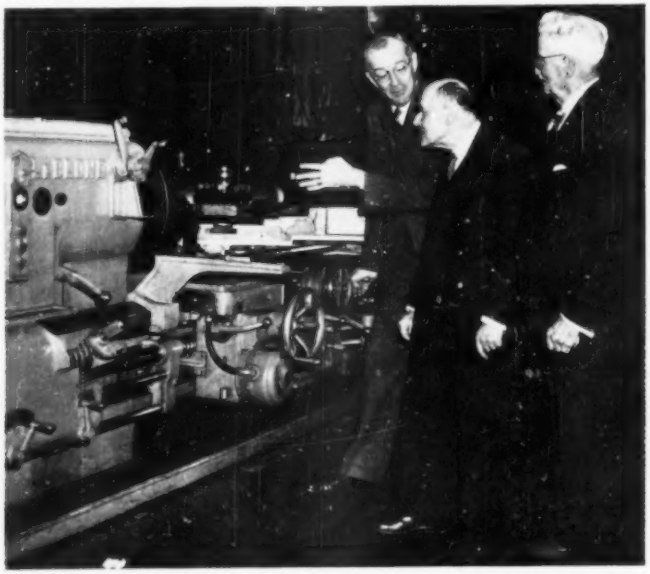
Chrysler Corp.'s Los Angeles and San Leandro plants are "buying all that can be bought here, with no preference to West Coast goods," N. K. Lillis, purchasing agent, said. West Coast producers must meet Eastern competition.

Studebaker's southern California assembly plant hasn't increased local purchases because production "doesn't warrant duplicate tooling," purchasing officials reported. Studebaker buys trim metal, springs, bolts and small accessories on the coast.

Norris Stamping & Mfg., which makes wheels for most of the automotive assembly plants. It operates one press metal line, turning out 150,000 to 200,000 wheels per month and shipping a few East.

Russell, Burdsall & Ward, supplying bolts, screws and nuts from chassis and bodies. It has 110 employees on its production lines.

Russell Bolt Mfg., supplying capscrews, bolts and nuts, using 45 men. Only about 15 to 25 percent of the company's $2,000,000 gross output goes to West Coast auto assemblies.



***LeBLOND HYDRA-TRACE** duplicating attachment is explained to Leon Hure, head of L. Hure & Co., Paris, by R. E. LeBlond, president, and R. K. LeBlond, founder and chairman of R. K. LeBlond Machine Tool Co., Cincinnati. M. Hure headed group of 19 French machine tool buyers on a recent ECA-sponsored tour of U.S. machine tool centers. He served an apprenticeship at the LeBlond plant 45 years ago under direction of R. K. LeBlond*

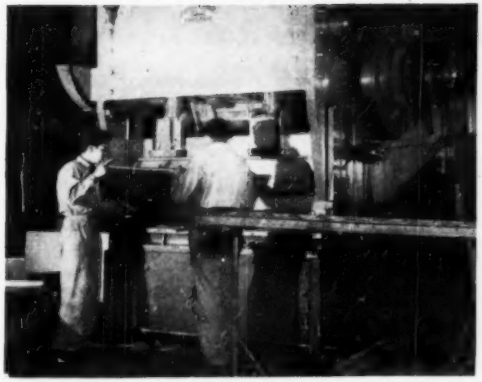
4 Aircraft Manufacturers Compete for USAF Orders

NEW YORK—Four aircraft manufacturers are competing for high stakes in the USAF evaluation tests to select a large Arctic rescue helicopter. The contenders are Bell, McDonnell, Piasecki and Sikorsky.

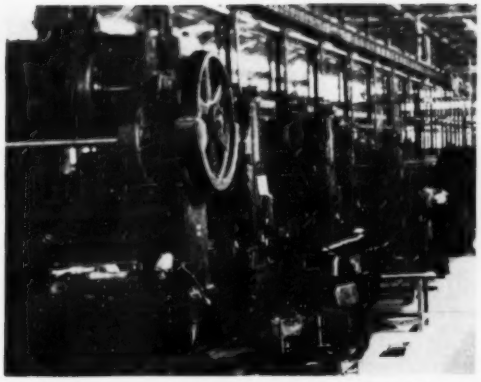
Besides the USAF contract, the winning company will get an important boost over the development cost hurdle which has hampered helicopter progress since war's end.

The winner also will be in a favorable position to garner Navy contracts for large helicopters, to be used in rescue work and as Marine beach-assault transports.

The Evaluation Board, according to the publication, is looking for a copter large enough to rescue the entire crew of a disabled bomber in one trip and with enough fuel capacity to make a fairly long rescue mission, and still hover over the rescue spot for about a half hour.



DESK PARTS *in DM Nacional's plant being formed on Dreis & Krump press brake. Firm also makes appliances*



PRESS SHOP *scene in Industria Electrica de Mexico factory now turning out 1700 refrigerators per month*

Two Up-to-Date Mexican Firms Seek To Meet Nation's Appliance Needs

By John Wilhelm
McGraw-Hill World News

MEXICO CITY — Two Mexican manufacturing plants have stepped out in front in the race to fill the business void left by Mexico's ban on further importation of such luxury goods as electric refrigerators and automatic washing machines.

These two, Industria Electrica de Mexico S.A. (IEM) and DM Nacional S.A., are probably the newest and best equipped of their kind of plant in Mexico's growing industry.

IEM has stepped up production of its own make of refrigerators to 1700 units per month to take care of demand formerly satisfied by imported units. It operates under Westinghouse patents, although over 51% of the stock is held locally. Other products are latest types of gas stoves, washing machines, and electric appliances. It also makes a "Coldspot" refrigerator for Sears-Roebuck's Mexico City store.

Wholly-Owned Mexican Plant

DM Nacional, whose initials stand for Distribuidora Mexicana, which was the parent firm, is a wholly-owned Mexican plant whose modern and streamlined factory on the outskirts of Mexico City would be a model in any country.

Originally engaged in making office furniture, DM Nacional has now turned to making cabinets for Bendix automatic washers, cabinets for Servel and Frigidaire refrigerators, and food liners for GE refrigerated units. It still remains Mexico's largest manufacturer of office furniture.

Antonio Ruiz Galindo, Jr., head of DM Nacional, contends that the future of Mexico lies in industrialization and not in agriculture or any other more commonly accepted field. And Mexico, he adds, "has the natural resources and the potential labor supply to become an industrial country that can compete without concession in many fields."

Mexican Needs Surveyed

IEM's history started only recently with a gathering of Mexican and American industrialists and bankers led by representatives of the Banco Nacional de Mexico; Kuhn, Loeb & Co., New York; and Westinghouse Electric International Co. An analysis of the Mexican market had revealed to them that Mexico would need in the period 1948 to 1953 roughly a billion pesos worth of electrical goods that could be manufactured by the projected plant.

Construction work was begun on IEM's 50 million peso plant north of Mexico City in Dec., 1946. Straight line production began in May, 1948.

The factory was organized into six distinct manufacturing divisions and company officials now estimate that it can supply 50% to 75% of Mexico's requirements in most electrical items.

The Household and Commercial Products Division makes refrigerators, beverage coolers, electric irons, gas and electric ranges, water heaters, air conditioning units, and light fixtures. The Rotating Equipment Division makes motors and generating equipment. The Special Products Division undertakes special jobs, either manufacturing parts or assembling them. Items include water buckets, shafts for diesel engines and steam turbines, machine castings. Other divisions: Transformer, Switch Gear, Insulation.

IEM now imports close to 100 million pesos worth of supplies, almost entirely from the U.S. These supplies are used in the various finished goods it turns out.

Began as Furniture Plant

DM Nacional is not an electrical industry. It got started as a small factory making office furniture from wood. When the factory burned a year later, a new and bigger one was built. The business came along so well that in 1946 today's plant was built and batteries of Cincinnati and Cleveland presses were installed to stamp out steel furniture.

The plant could turn out all the office furniture needed in Mexico in only a part of its operating time. Thus it was natural to get into the refrigerator and washing machine business.

New Attachments Increase Industrial Truck Uses

NEW YORK—Tremendously increasing the versatility of industrial trucks, attachments now permit direct handling of many items that formerly could be lifted only with pallets, it was revealed by Yale & Towne at a demonstration held here recently. Hydraulically operated, these units can be attached to standard trucks to give fast, low-cost handling.

Among units shown was a keg handler consisting of five clamps that operate simultaneously to grasp and lift six 100 lb kegs at once without a pallet. Another flexible unit consisted of pivoted forks that can be operated in conjunction with radius clamps for drum handling or without the radius clamps to handle unit loads.

Detroit

MORE OUTPUT FROM NEW OLDS, CHRYSLER PLANTS . . . WILLYS OFFERS NEW ENGINE . . . 6,500,000 CARS AND TRUCKS PRODUCED IN '49

Oldsmobile must be the darling of General Motors. That's a conclusion that might be drawn after visiting the new assembly plant of the division at Lansing. On top of the beautifully tooled engine plant opened more than a year ago, Olds now has a half-million-foot assembly operation which ranks with the best anywhere.

The transfer machinery which moves engine pieces through progressive operations in the motor building is echoed—in a different sphere—in this new assembly plant. Cars are transferred sidewise, automatically, from one assembly line to the next. Conveyors lug parts from manufacturing and storage stations—often in different buildings and in many cases far distant from the final assembly line—right to the point where they are required. Semi-automatic machinery assembles and solders (with induction heat) the gasoline tanks. Merry-go-round setups move operators and components for subassembly of front fenders, grilles, and radiators.

If you want to go to the restroom, you go on an escalator!

Olds, like the rest of GM, is moving on a flood tide of acceptance. For the 1949 model year a total of 288,586 assemblies were chalked up, eclipsing the previous all-time high of 270,038 in the 1941 model year. Use of the new plant will permit capacity of 350,000 units next year, and officials make it plain they have every intention of crowding that potential production figure.

Olds Lowers Prices

One way they will be able to do it is with lower prices. The "88" series, middle line of the company, has been cut $55 to $65 effective for 1950, in addition to the $25 reductions on Hydra-Matic transmissions announced earlier. The "88" line accounted for more than a third of total Olds production in 1949, and is expected to be proportionately even more popular in 1950.

Pontiac, meanwhile, has maintained its 1949 prices intact. Buick will be out before long, but all it will say in advance is that "our prices won't be any higher."

Buick, incidentally, did a neat trick for its 1950's. It is offering a new engine developing 128 hp with Dynaflow transmission—a high compression type with 7.2 to 1 ratio. It was produced without a volume outlay of machine tool buying. Engineering sleight-of-hand made it possible to retool a considerable number of machines to the point that they could turn out the new parts required.

The new engine, to appear on the Super series, is more compact than its predecessor, with fractional inches saved on cylinder crankcase height, connecting rods and piston lengths.

Willys-Overland, too, promises high compression developments, of a more pronounced sort. A new powerplant is in advanced test stages, and will be available in both four and six cylinders for spring. Higher powered than the current Willys engine, it is said to possess "revolutionary" features. Some testing has been carried out at ratios of 8 to 1, but the final result will be around 7.5 to 1.

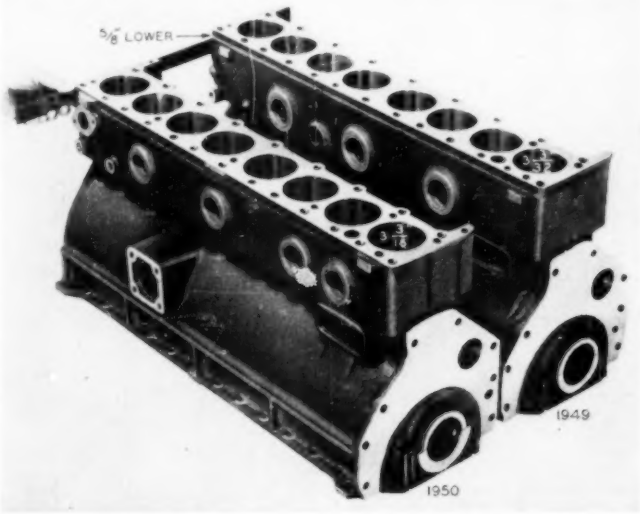
Chrysler Press Plant Completed

Now that Chrysler's new press plant near Nine Mile Road has been completed the company is evincing a little willingness to talk about it a bit. The size is still somewhat veiled, but it does increase company stamping capacity about 25%.

This new operation permits fast installation and removal of the largest size presses. One reason is the willingness of press makers to design their products so that most of the moving parts are above floor level. The other is the move of Chrysler Corp. in meeting this improved designing with laminate timber flooring which can be removed in sections—with open basements underneath which allow ready access to the vitals of the equipment, to the die cushions, etc.

The new plant is using 45 presses from triple action jobs which weigh 440 tons each and exert 900-ton pressure on work in process, down to 10-ton single action machines. In addition, it includes a die shop equipped with the most modern requirements.

The production year ended in a blaze of glory. Aggregate output, once all the figures were in, was expected to crowd 6,500,000 cars and trucks for the full year, volume having recovered in the latter days of December to a point far above the low figure of about 54,000 assemblies registered in the second December week. All companies by now are working on 1950 models, except for Kaiser-Frazer.



***NEW VALVE-IN-HEAD** straight-8 engine has been designed for the 1950 Series 50 Buick, with a 3 3/16 in. bore and 4⅛ in. stroke. Total piston displacement is 263 cu in. Maximum brake hp is 128 at 3600 rpm with 7.2:1 compression ratio when used with Dynaflow transmission, and 6.9:1 compression ratio, providing 124 brake hp, with Synchro-Mesh transmission. Cylinder crankcase height has been decreased ⅝ in., and connecting rods have been shortened ¼ in. Piston length has been decreased 9/16 in. with ⅜ of the decrease above the piston pin.*

Names in the News

John A. Proven

John A. Proven has been named vice president in charge of sales, Porter-Cable Machine Co., Syracuse, N. Y. He joined the firm a year ago as sales manager. Previously he was vice president and sales manager of Sterling Tool Products Co., Chicago. He is a member of the executive committee of American Supply & Machinery Manufacturers Assn.

Frank D. Mumford has been named parts sales manager of E. W. Bliss Co., Toledo. He has spent 23 years in parts engineering and sales work for Bliss and its Toledo Div.

J. H. Berryman has been named asst. to the manager, Technical Sales Div., Air Reduction Sales Co.

F. P. Taugher has been named manager of engineering for Westinghouse Electric Corp's Industrial Control Div., Buffalo, N. Y. He has been engineering and service manager in the company's New England district for the past five years. **M. L. Gardner** succeeds Mr. Taugher in the New England district.

Leo F. Brown has been named plant manager of the air conditioning equipment plant of General Electric Co.'s Air Conditioning Dept., Bloomfield, N. J. **Edward D. Kemble** has been named plant manager of the Automatic Heating Div. at Bloomfield.

W. H. Klocke has been named consulting engineer for Cleveland Punch & Shear Works Co. He is responsible for inventing and developing the double action toggle press used extensively in production of fenders, bodies and cowls, as well as special presses used for stamping chassis frame. He holds numerous other press construction patents here and abroad.

Edgard C. DeSmet has been named to the newly-created post of director of body engineering for Willys-Overland Motors, Inc. He has been at Willys 13 years, serving successively as assistant chief engineer, chief engineer of the wartime aircraft division, and assistant to the vice president in charge of engineering. Prior to joining Willys he was with the Locomobile Co., Dodge Bros., Briggs Mfg. Co., Hudson Motor Car Co., and the Chrysler Corp.

C. R. Gall has been named vice president of Hudson Motors of Canada, Ltd.

Max L. Murdock, acting manager of the centrifugal pump dept. at Allis-Chalmers' Norwood (Ohio) Works, has been named manager of the department, succeeding **H. C. Gaton,** retired. **Woodrow Brixius** has been named assistant to Mr. Murdock and **Paul B. Hugenberg** has been appointed application engineer in charge of sales and orders.

H. R. Salisbury has been appointed president of Air Reduction Sales Co., New York. Appointed vice presidents were: **H. F. Henriques,** general sales; **J. J. Lincoln, Jr.,** railroad sales and sales services; **S. B. Stouffer,** distribution; **N. L. Wisser,** field office management.

Frank Brown has been appointed plant engineer of all Akron plants of B. F. Goodrich Co., Akron, Ohio. **George Murphy** has been named plant manager at Plant 4, reporting to Mr. Brown. **Clifford R. Augden** has been named superintendent of shops.

Harvey W. Hanners

Harvey W. Hanners has been named chief engineer, Superior Engine Div., National Supply Co., Pittsburgh, succeeding George F. Noltein who has been named director of research.

J. D. Harbaugh

J. D. Harbaugh, plant manager of Chevrolet-Detroit Gear & Axle Div., General Motors Corp., has been named manager of Detroit plants. This includes both Detroit Gear & Axle and Detroit Forge Divisions. **R. W. Podlesak,** plant manager of the Chevrolet assembly plant at Janesville, Wis., succeeds Mr. Harbaugh as plant manager of Detroit Gear & Axle Div. Other appointments: **J. L. Coyle,** manager, Janesville plant; **A. R. Roskilly,** plant manager of Chevrolet-Muncie Div., succeeding Mr. Coyle; **I. B. Scofield,** general supt. of Chevrolet-Flint Mfg. Div., assigned to special duties there; **B. D. Marshall,** asst. manager, Flint Mfg. Div.; **F. C. Hillman,** plant manager, Detroit Forge Div., succeeding Mr. Marshall; **M. W. Clark,** plant manager, Motor Div. at Flint succeeding Mr. Hillman.

Waldemar Naujoks has joined Ladish Co., Cudahy, Wis., as special projects engineer, working on development of ferrous and non-ferrous alloy forgings.

Marvin L. Katke has been named plant manager of Ford Motor Co.'s projected automatic transmission plant at Cincinnati. His last post before joining Ford was superintendent of the Oldsmobile engine plant at Lansing, Mich. **Carl T. Doman** has been appointed to the staff of the Ford Div.'s vice president and general manager. He was formerly with H. H. Franklin Mfg. Co. and Aircooled Motors Corp. of Syracuse, N. Y.

Francis B. Dunn has been named manager of the Houston Works, A. O. Smith Corp., Milwaukee. **C. W. Wheatley** has left Houston to return to the company's headquarters, resuming his work on the general staff. **L. F. Vonier** has been named general sales manager, Welding Electrode & Equipment Div.

J. R. Rose has been named sales manager of the western district for Townsend Co., New Brighton, Pa. He will have headquarters in Chicago.

Walter W. Kemphert

Walter W. Kemphert has been named vice president in charge of sales, Maurey Mfg. Corp., Chicago. Previously he was with Worthington Pump & Machinery Corp., Harrison, N. J., as manager, Merchandising Div., and later vice president of Sales at Skilsaw, Inc. Chicago.

W. E. Lunger, district manager of the Huntington, W. Va., plant of the American Car & Foundry Co., New York, has been appointed assistant vice president in charge of production, with headquarters in New York. Succeeding Mr. Lunger at Huntington is **J. E. Koontz,** now assistant district manager of that plant.

Ray P. Johnson has been named administrative assistant to the executive vice president of Borg-Warner Corp., Chicago. He will retain his post as vice president of Morse Chain Co., a Borg-Warner division. He also is a director of Borg-Warner. **William J. McQuillan** has been named branch manager, Pittsburgh Office, Morse Chain Co.

George C. Stamets has joined Wm. K. Stamets Co., Pittsburgh, as sales engineer.

A. M. Shaw has been named assistant manager, Pump & Compressor Merchandising Div., Worthington Pump & Machinery Corp.

J. R. Gelomb has been named manager for eastern Iowa and Moline, Ill., districts of Wel-Met Co., Kent, Ohio. He will have offices in Davenport, Iowa. He was formerly Detroit manager for Timken Roller Bearing Co.

John V. Eakin, formerly southwestern district manager, has been named assistant sales manager, Fawick Airflex Co., Inc., Cleveland. **J. S. Walsh** has been named assistant chief engineer. **Frank C. Warth** and **C. H. Lay** have been named managers of the southwestern and Chicago districts respectively.

Gerard M. Haley has been named director of purchases for Chevrolet Motor Div., General Motors Corp., Detroit. Other purchasing agent appointments: **E. F. Gormsen,** Central Office; **E. J. Furbacher,** Gear and Axle and Forge plants; **Kenneth V. Daniels,** Toledo plant; **George B. Ford,** Saginaw Grey Iron Foundry; **Carl S. Allemang,** Chevrolet Parts Mfg. Div., Saginaw; **Milton J. Schemm,** assistant purchasing agent, Central Office.

Business Items

Gilles Machinery Co. has been formed by Edwin J. Gilles, Cleveland, to represent machine tool manufacturers. For the past 15 years, Mr. Gilles was half owner of the Jeffery-Gilles Co., recently dissolved. The new firm will represent Hendey Machine Co., Gallmeyer & Livingston Co., Cleveland Planer Co., Armstrong-Blum Co., and Cushman Chuck Co.

Mokry-Tesmer, Inc., a new company, has acquired the Mokry & Tesmer Machine Co., Middletown, Ohio. A substantial interest in the new organization will be owned by Bagley & Sewall Co., Watertown, N. Y., and Shenango-Penn Mold Co., Dover, Ohio. The new firm will be headed by Paul E. Howard, formerly of Bevis Machine Co.

Electric Boat Co.'s Electric Dynamic division, Bayonne, N. J., will manufacture the auxiliary electric motors for the new U.S. Lines superliner being constructed by the Newport News Shipbuilding and Dry Dock Co. The order covers motors for a variety of applications, including centrifugal and rotary pumps, centrifugal and reciprocating compressors, steering gear, windlasses and capstans.

John Nooter Boiler Works Co., St. Louis, Mo., has changed its name to Nooter Corp. The company now fabricates tanks and vessels of steel and alloy plate.

Hauser Machine Tool Corp., Manhasset, N. Y., has been appointed exclusive U.S. factory representative for Tornos Works, Ltd., Moutier, Switzerland, and for Schaublin Ltd., Bevilard, Switzerland.

Inland Container Corp. will move some personnel and equipment from its Lockland, Ohio, plant to Middletown, Ohio, where a new $150,000 addition is being built.

Garringer Mfg. Co. has started operations in a plant at Washington Court House, Ohio, manufacturing live centers.

General Electric Co. is expanding transformer manufacturing and testing facilities at Pittsfield, Mass., to more than double the company's power transformer production capacity. Costing several million dollars, the new facilities are expected to be placed in operation about mid-1950.

Cleveland Graphite Bronze has formed a Canadian subsidiary, Clevite Ltd., which has bought the former Monarch Knitting plant in St. Thomas, Ont., for early production of sleeve-type automotive engine bearings.

Marquette Machinery Co. has moved into its own building at 13201 Prospect Ave., in Dearborn, Mich., recently completed to house offices and show room.

Black & Decker Mfg. Co., Towson, Md., has moved its Atlanta, Ga., factory sales and service branch to a new building at 316 Techwood Drive, N.W.

Kinray Industries, Inc., Youngstown, Ohio, a new corporation, has purchased all the assets of Kinray Mfg. Co. and will manufacture screw machine products.

Size Control Co. and **Walsh Press & Die Co.** have opened new offices at 3344 West 105th St., Cleveland. The two firms are divisions of American Gage & Machine Co., Chicago.

Kelsey-Hayes Wheel Co. has moved its San Francisco plant to Los Angeles. Brake drums, power brakes, and hubs will be produced there.

Obituaries

Ethan Viall, chief editor of AMERICAN MACHINIST in 1920 and managing editor before then, died at his home in Knox, Indiana, Dec. 15.

Harry J. Merrick, 46, executive secretary of the Cutting Tool Manufacturers Assn., died Dec. 12. He was appointed in 1943 to the National War Labor Board, leaving there in 1944 to join CTMA when the Association was formed.

Julis P. Heil, 73, board chairman of Heil Co., Milwaukee, died Nov. 30. He was Republican governor of Wisconsin from 1939-42. He was named chairman of Heil Co. after retiring as president in 1946.

William E. O'Connor, 75, associated since 1906 with Cleveland Automatic Machine Co., Cincinnati, died Nov. 14. At the time of his retirement in 1947 he was service engineer in the New York territory.

Machines, Not Dollars, Keep a Company Competitive

The fallacy that there is security in the possession of dollars is the greatest resistance factor in the sale of new machine tools.

• A company may have money in the bank and a plant ready for the scrap heap.

• The balance sheet shows what has happened. The equipment in the shop shows what will happen. The equipment inventory tells the real story.

• There is far more danger in not buying new equipment than in buying it.

• The real security of any bank loan to a metalworking company rests in that company's ability to continue to maintain and expand its markets in a competitive economy. That ability rests in turn on the nature of the company's productive equipment.

These points were brought out forcefully by J. A. Raterman, president, Monarch Machine Tool Co., Sidney, Ohio, in an address at a meeting of the Machinery & Allied Products Institute in Washington Dec. 2. Mr. Raterman's speech follows:

If the metalworking plants of this country would buy new machine tools at the rate at which they ought to buy them, the machine-tool industry's postwar troubles would be over. But the fact is that **replacement has been so slow that today 95% of the machines in use are over 10 years old in design. This is an appalling situation.**

There never was a time when management was more conscious of cost and the need to reduce cost; or when there seemed less likelihood of reducing cost by cutting wages or taxes; or when productivity through the use of improved equipment seemed so obviously the only way out.

Why, then, have users not been buying more of the new, improved machine-tool models?

Is it because we have fallen down in our sales effort? I think the answer is "No" as far as plant operating men are concerned. But I am afraid the answer is "Yes" as far as financial men are concerned. By financial men I mean the executive officer of the company who finally passes upon proposed capital expenditures, the banker on the board, and the banker extending long-term credit.

Why does the finincial man say "No"? Is it because he thinks our machine tools won't do what we claim they will do? Is it because he thinks our new models are not far better than the old?

The truth is that that isn't the reason at all. Today's reluctance on the part of users to buy new machine tools doesn't appear to have anything to do with machine tools themselves. It is a sales resistance founded upon intangible factors. And when we analyze these factors, the amazing thing is that they apply just as much to the capital goods industry itself as they do to machine-tool users.

Our greatest sales-resistance factor is the fallacy that there is security in the possession of dollars.

When business executives get together, they are fond of talking about the gullible American public that votes for security when there really is no such thing as security. They tell each other that this passion for security on the part of the people will some day impose a burden on the economic system that will destroy all hope of security.

And then these same business executives will go back to their own offices, and with respect to their own affairs give a perfect imitation of the voting public they were criticizing a few minutes before.

Do they prefer opportunity to what they think is security? No!

Are they willing to take a risk, in the hope of profits under the free-enterprise system? No!

They say, "We've got so much cash in the bank, and we are going to make darn sure we have that much cash in the bank a year from now."

They say, "Unless a piece of new equipment will obviously pay for itself in two years, we are not going to buy it. We are going to follow a conservative policy."

That policy is not conservative. It is disastrous. It is the policy of stagnation that leads to economic retrogression. It is the policy of obsolescence and destruction of capital values. It is a policy which instead of conserving resources consumes them by dry rot.

For, while the bank balance may remain unimpaired, the plant goes down hill until at long last the physical assets which represent the company's working assets and measure its ability to compete, are dissipated.

This is not the road to security. This is the road to liquidation. If allowed through to its logical conclusion, a company would have money in the bank and a plant ready for the scrap heap. Is that security?

This situation is aggravated by our country's progressive trend toward hired management. I am a hired man myself; so I can talk freely. The trouble with hired management is that it always feels it must make a good showing this year. It is always afraid of being criticized for reinvesting in the future a large share of the company's earnings, which otherwise might have gone to the stockholders in dividends. It is always worried for fear it will be criticized for having a balance sheet that does not show a sufficiently strong cash position. It is difficult for hired management to explain to stockholders or to a bank why money invested in capital goods rep-

resents greater security for a company than money in cash.

The banker certainly does not help this situation. There is altogether too much so-called "quick-asset" banking in this country. Bright young men who as they say, "know how to read a financial statement," pass upon a company's current position.

These young men may be expert at figures, but they don't know a planer from a turret lathe. The amount listed in dollars on the balance sheet as representing plant and equipment is no guide today to the actual worth of that equipment from the standpoint of the security of the company's future. The balance sheet shows what *has* happened, but the equipment in the shops shows what *will* happen.

When a bank makes a loan to a metalworking company, the real security of that loan rests in that company's ability to continue to maintain and expand its markets in a competitive economy. That ability rests in turn on the nature of its productive equipment.

In estimating a credit risk, a bank must go behind the financial statement to get at the facts. It must go into the plant, analyze the equipment, find out how much of it is obsolete and how much is modern, determine how much should immediately be thrown out and replaced, and what this replacement would cost.

This latter figure represents the amount of the capital investment that that company should make tomorrow if it is to remain a good credit risk. In other words, there isn't anything wrong with statistical banking, except that banks are using the wrong set of statistics.

It is the equipment inventory rather than the balance sheet that tells the real story.

As things stand, the banker's emphasis on cash position, plus management's hesitation as to new ventures on behalf of the future for fear of stockholder criticism, combine to stop the executive from approving new-equipment purchases which, from an operating standpoint, he knows full well he should make.

Furthermore, there is today an excellent excuse for not making more new equipment capital expenditures. It is the present Internal Revenue policy with respect to depreciation.

Machine-tool models are rendered obsolete on the average in about seven years. I don't think any user figures the profitable life of a new machine at more than 10 years. Yet the government insists that it be depreciated over at least 20 years.

This means that if the capital invested is to be recovered in 10 years, or in the profitable life of the machine, only half can be recovered out of depreciation. The other half must come from earnings upon which the company pays federal income taxes.

See the dilemma in which management is put? In the first place, if the cost could be recovered in 10 years, replacement money would not have to come out of reported earnings, although the amount would be the same. There would not be the risk of stockholder criticism.

Secondly, the effect of present Internal Revenue practice is that of literally adding 10% to the cost of new equipment—38% of one-half the purchase price, in case the company pays the full federal income tax. This is, in fact, a government-imposed penalty upon modernization.

Though this is an excellent excuse for not buying, the end results of failing to buy cannot be avoided, no matter what excuse is offered. If a nation's plant equipment continues to run down hill—if this country fails to take advantage of technological advances —the end results are higher prices, a retrogression in the standard of living, and eventually the possible destruction of the free-enterprise system.

We in the machine tool industry have so far been doing only one-half of our sales job. We have tried to sell new machines. What we should be selling is the futility of money in the bank as a means of security, and the imperative necessity of replacement in spite of tax penalties.

We have been talking shop arithmetic. Instead we should be talking what somebody has termed "upstairs arithmetic."

Somehow, we must get hold of the financial man and convince him that there is far more danger in not buying new equipment than there is in buying it. Somehow, we must convince him that it is machines, not dollars, that keep his company competitive. And we must convince the bankers of the same fact.

In criticising management of American industry, I am not exempting management in the capital goods industry and management in the machine tool industry itself.

Among those here today are representatives of the heavy capital goods industry, the conveyor industry and the light capital goods industry. All these industries require machine tools; and it is my guess that the percentage of obsolescence in their machine tool equipment is about the same as the national average.

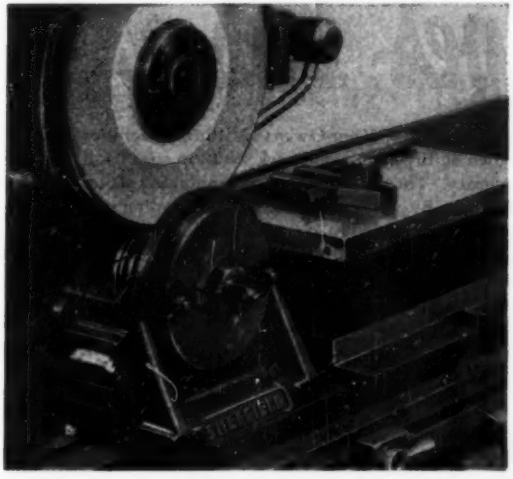
These industries are no doubt complaining about the failure of their customers to modernize at the rate indicated by new cost-cutting possibilities which they have developed. But if they believe their own story, why have they not bought more new machine tools?

And let's take the machine-tool industry itself. Machine tools are made on machine tools. Is our replacement so much better than industry as a whole?

Do you see what's happening? We seem to have lost the old American spirit of venture which is the very foundation of the free-enterprise system. Like everybody else, we have become obsessed with the idea of security.

Our course of action is clear. First of all, let's look inward in our own companies and see what we should replace today. Let's take our own medicine. Then having got our own houses in order, we can go out and sell our medicine to the bankers and to our customers.

Cut Grinding Time up to 75%



and Reduce the Cost

of Dressing Tools at the Same Time

If you are producing threaded or formed parts, flat or cylindrical, you can make significant savings in both time and over-all costs by the use of Sheffield Crushtrue Devices on commercial surface and cylindrical grinders.

A Crushtrue Roll forms the face of the grinding wheel accurately regardless of how intricate the form may be. Work parts are then ground with this wheel in much less time than is possible by any other method of wheel forming.

Sheffield maintains a stock of Crushtrue Rolls for immediate delivery on all standard U. S. threads from 8 to 32 pitch. When your Std. U. S. Thread Rolls need regrinding, ship them to Sheffield and reground rolls from Sheffield's "Bank" will be shipped to you within 24 hours. You don't have to wait for your original rolls to be reground.

As long as you continue returning your Sheffield standard thread Crushtrue Rolls for regrinding, you will get immediate replacements on an economical cost basis. You will never have to buy new rolls.

The Sheffield "Bank" plan reduces your costs and down time if you manufacture threaded production parts, thread rolling dies or 60° serrated tools. Sheffield Crushtrue Rolls are the answer to greater economy and more productivity.

Crushtrue Rolls for special threads and forms can be supplied economically and promptly.

Write for information or for a personal conference.

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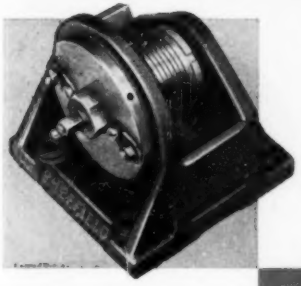

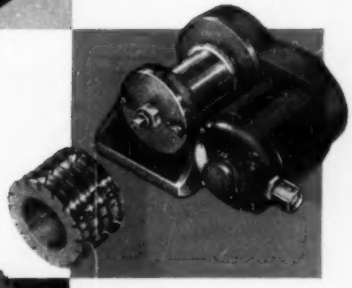

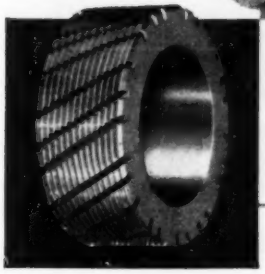

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MASTER CRAFTSMEN SHEFFIELD

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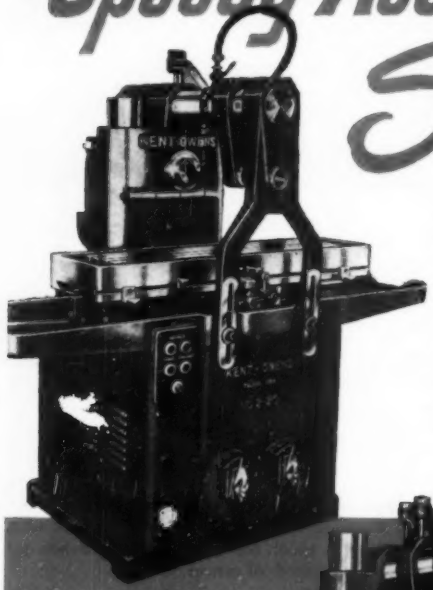

On countless jobs—Kent-Owens Milling Machines have shown ability to turn out work with top speed and high accuracy. They're designed for rapid, easy set-up and operation. Rugged . . . with twin-post head mounting that assures balanced load—no chattering. Practical features throughout to help you *produce more* . . . with *lower costs!* Write for bulletins on the Kent-Owens Standard line . . . including wide range of hydraulic and hand operated machines. Also, let our engineers help you with tooling and special machine requirements.

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No. 2-20 . . . 20" table travel . . . 42" x 12" table . . . full automatic hydraulic feed.

No. 2-20 DS . . . Double Spindle for two milling operations . . . 20" table travel . . . 42"x12" table. Hydraulic feed.

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For Milling Machines

Finishing Treatments for Magnesium . . . II

BY JEROME L. BLEIWEIS, Metal Finishing Consultant

Dichromate Process

Purpose — To produce a corrosion-resistant coating on magnesium and magnesium alloys, especially where a high degree of salt-water corrosion resistance is desired.

Nature of Coating—The coating consists essentially of magnesium oxide, chromate and dichromate, and chromium chromate and dichromate. Properly applied coatings will vary from dark brown to black.

Treatment Procedure:

1. Clean work by alkaline cleaning, which is preceded by vapor degreasing if required.
2. Rinse in cold water.
3. Immerse work for 5 min in a water solution containing 15 to 20% by weight of hydrofluoric acid at room temperature.
4. Rinse in cold water.
5. Immerse in a boiling water solution of sodium dichromate (10 to 15% by weight) for 45 min.
6. Rinse in cold water followed by hot water to facilitate drying.

Notes and Comments:

1. The dichromate treatment is known by proprietary designations; Dow No. 7 Treatment (Dow Chemical Co.), and Treatment AMCG (American Magnesium Co.).
2. No dimensional changes are caused by this treatment.
3. The treatment is applied after machining and before painting.
4. Brass, bronze and steel inserts are unaffected by this treatment, but aluminum and cadmium are rapidly attacked during the hydrofluoric acid dip.
5. The hydrofluoric-acid bath is depleted slowly, but should not fall below 10% HF.
6. The sodium-dichromate solution may be controlled by maintaining its pH between 4.2 and 5.5 by additions of chromic acid.
7. Lead tanks may be used for containing the hydrofluoric acid bath. Iron tanks lined with Koroseal are also satisfactory.

Also see sealed chrome-pickle process and anodic treatment (*AM*—July 28, 1949, p. 119).

Modified Alkali-Chromate Treatment

Purpose—To provide a protective coating for magnesium and its alloys having improved abrasion resistance over the dichromate coating.

Nature of Coating — Properly applied coatings will vary from dark gray to black and will be fairly hard and abrasion resistant.

Treatment Procedure:

1. Clean by vapor degreasing if necessary, followed by alkaline cleaning.
2. Rinse in cold water.
3. Immerse for 5 min in a 15 to 20% by weight solution of hydrofluoric acid at room temperature; rinse in cold water.
4. Immerse for at least 45 min in a boiling water solution containing:

   Ammonium sulfate 4 oz/gal.
   Sodium dichromate 4 oz/gal.
   Ammonia (sp. gr. 0.880) 1/3 fl oz per gal.

5. Rinse thoroughly in cold running water.
6. Immerse for at least 5 min in a boiling aqueous solution containing 1% by weight of arsenious oxide.
7. Rinse in cold running water followed by hot water to facilitate drying.

Notes and Comments:

1. This treatment is also known as the acid-alkaline dichromate treatment, Dow Treatment No. 8, and Treatment AMCH.
2. Treatment No. 8 is almost as protective against salt water as treatment No. 7, while the coating formed is somewhat harder and more abrasion resistant.
3. Dimensional changes are negligible, and the treatment may therefore be used on machined parts.
4. Brass, bronze and steel inserts are unaffected during the treatment, but aluminum or cadmium plate is rapidly attacked during the hydrofluoric-acid dip.
5. Time of treatment, condition of bath and alloy composition influence color of coating.
6. Where heavy oxide films appear on the parts, they should be removed by sandblasting, pickling, wire brushing, etc.
7. The advantages of the dichromate treatment apply to the modified alkaline dichromate treatment as well. However, it is not used as frequently, because it employs a more complex solution and requires an additional step not required by the dichromate treatment.

Want to CUT COSTS? See EX-CELL-O

EX-CELL-O Special Machine Combines Operations to Save Handling...Save Man Hours...Save Space

This Ex-Cell-O Special Machine for turning the tapered ellipse on automotive pistons does a complicated machining job while still maintaining a high rate of production and fine finish. Ex-Cell-O used as a basis for this operation a standard Style 61 Precision Cylinder Boring Machine. Production is 180 pieces per hour net. The engineering "know-how" that makes a job like this possible is available to you through Ex-Cell-O. Write Ex-Cell-O in Detroit today!

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EX-CELL-O CORPORATION DETROIT 32

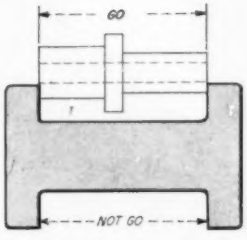
Special Multiple Way-Type Precision Boring Machines • Special Multiple Precision Drilling Machines • Precision Boring, Turning, and Facing Machines and Fixtures • Precision Cylinder Boring Machines • Precision Thread Grinding Machines • Precision Lapping Machines • Precision Broach Sharpening Machines • Other Special Purpose Machines • Tool Grinders • Continental Cutting Tools • Broaches and Broach Fixtures • Counterbore Sets • Grinding Spindles Hydraulic Power Units • Drill Jig Bushings • R.R. Pins and Bushings • Fuel Injection Equipment • Dairy Equipment • Aircraft and Miscellaneous Production Parts

American Machinist REFERENCE BOOK SHEET

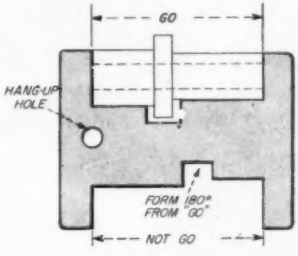
Gages for Screw-Machine Parts...I

BY HERBERT C. LINDBERG, Tool Engineer, HARTFORD MACHINE SCREW COMPANY

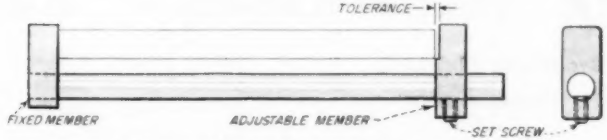
LENGTH GAGES



Cut out the profile in 1/16- to ⅛-in. sheet stock, harden, then grind. Stamp or etch gage with sizes, department and operation number

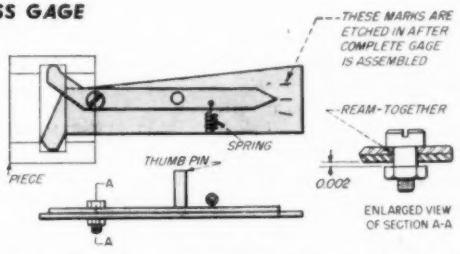


Better design supports work body and covers ends of products to improve gaging. Position of form in "not go" form is reversed, so gage can be spun around and presented to work in correct position



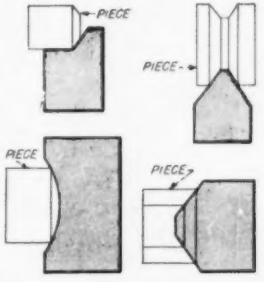
Long parts of several lengths (with same tolerance) can be gaged with this device, because the adjustable member is easily reset

RECESS GAGE



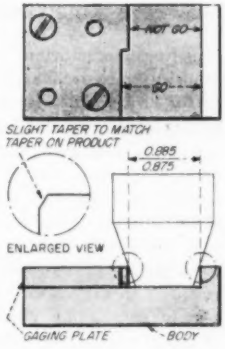
Popular in the screw-machine products field, the recess gage is graduated after device is assembled. If the product has a 0.010 in. tolerance, and the lever arms are made in a 5:1 ratio, the distance between tolerance marks will be 0.050 in.

TEMPLET GAGES

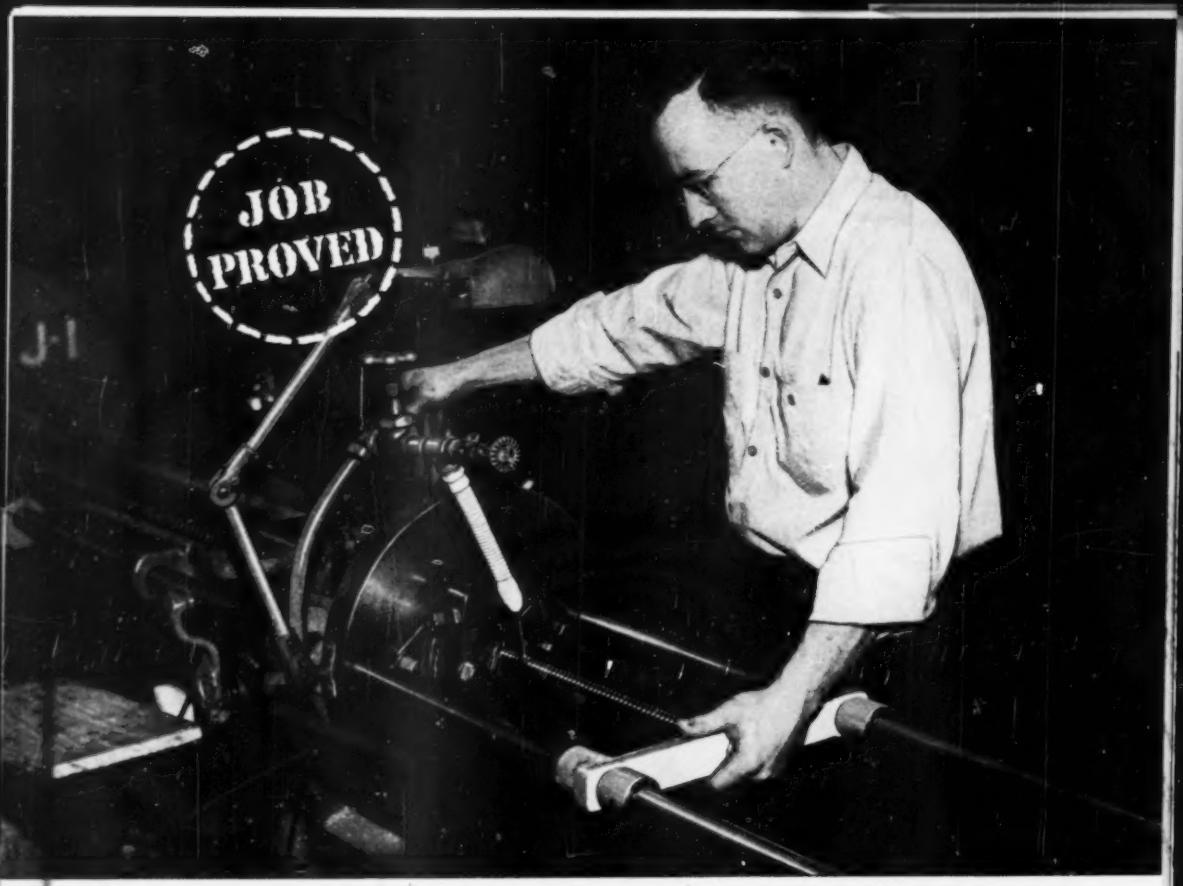


It is cheaper to make a templet gage to set tools and check the product than to rely on approximate methods, as is done too often

TAPER GAGE



Product diameter at a specified location on a taper is checked with a gage having a gaging plate with steps for the go and not go dimensions. In effect, correctness of the taper is checked by this means



TOOL LIFE INCREASED 25%

Sunicut Improves Broaching Finishes, Operators Like Its Transparency

A plant manufacturing valves was using an expensive straight animal oil for broaching. They were also adding large amounts of this product to the cutting oil used in most other machining jobs. Naturally, cutting oil costs were high.

On the advice of a Sun Engineer who had been called in, the company tried Sunicut. Good finishes resulted in all operations, completely eliminating the need for straight animal oil. Tool life increased 25 percent. Operators liked Sunicut for its transparency—it kept work visible all the time. The plant has been using Sunicut for 14 years with complete satisfaction. Two years ago, the company switched to Sunicut with Petrofac, and since then results have been even better.

Wherever operations involve tough cutting, tapping, or threading, the new grades of "Job Proved" Sunicut with Petrofac will give smooth, accurate finishes. The new grades of Sunicut possess superior metal-wetting, antiweld, and extreme pressure characteristics. They do not contain any animal or vegetable fatty oils—therefore cannot turn rancid.

For information about either Sunicut or the famous Sunoco Emulsifying Cutting Oil, call or write your nearest Sun Office.

Sunicut and Petrofac are trademarks of Sun Oil Company

SUN OIL COMPANY • ***Philadelphia 3, Pa.***

In Canada: Sun Oil Company, Ltd.
Toronto and Montreal

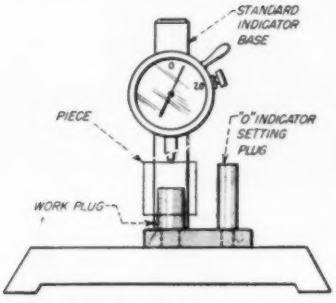
SUN PETROLEUM PRODUCTS SUNOCO

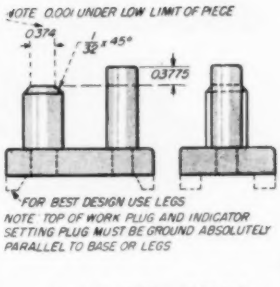
"JOB PROVED" IN EVERY INDUSTRY

American Machinist

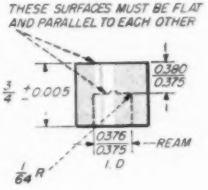
Gages for Screw-Machine Parts...II

SHOULDER GAGE

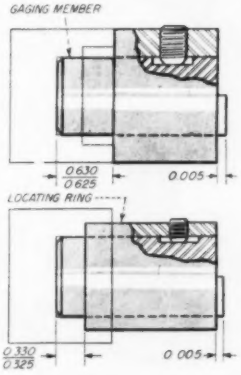



NOTE .0001 UNDER LOW LIMIT OF PIECE
0.374
1/32 x 45°
0.3775
FOR BEST DESIGN USE LEGS
NOTE: TOP OF WORK PLUG AND INDICATOR SETTING PLUG MUST BE GROUND ABSOLUTELY PARALLEL TO BASE OR LEGS

When an end face and the bottom of a hole must be flat and parallel, and held to specified tolerance (here 0.75 ±0.005 in.) gaging can be handled over two plugs set into a common base and used under a dial indicator. The work plug is made .001 in. under the low limit of the hole. The indicator plug is ground to the exact mean of the tolerance; namely, 0.3775 in. Legs, or feet, on the gage prevent chips from affecting the setup



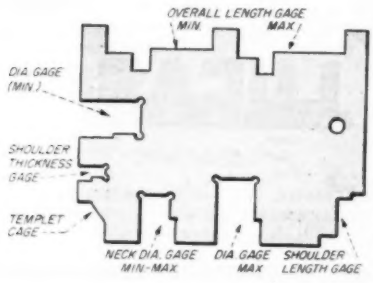
FLUSH-PIN GAGES

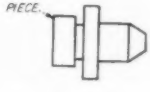


Specified depths in workpieces are conveniently checked with flush-pin gages. Setscrew holds gaging member while low limit is checked on a batch; then screw is released. If flush pin is not flush with or above surface of gaging member, the high limit on dimension has been exceeded

PLUG AND DEPTH GAGE

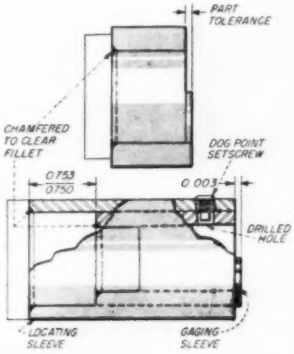
To check depth of a counterbored hole, a plug gage may have a pair of flats ground on one end





FORM GAGE

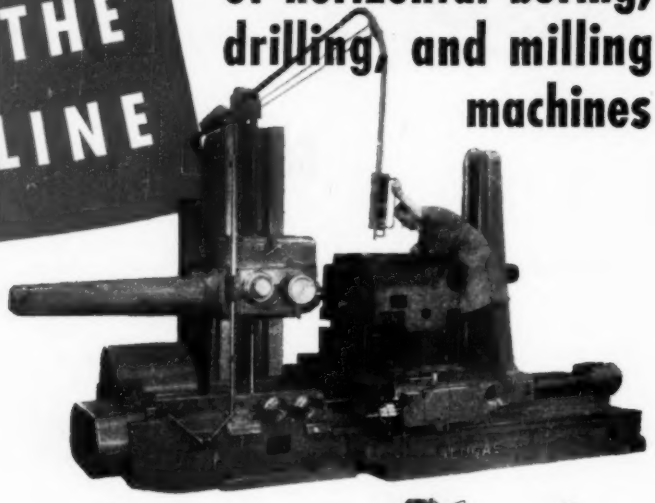
Form gages are bandsawed, filed, hardened and ground to decimal tolerances for maximum and minimum dimensions on the part. This common type of gage is often neglected for more expensive setups



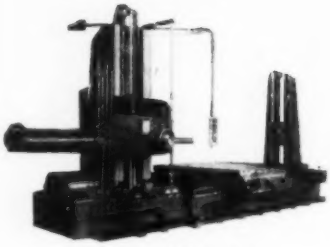
External dimensions can be checked with a one-part or two-part gage, as shown. As with previous internal gages, incorporation of a spring, to require force in gaging, improves reliability

THIS IS THE LUCAS LINE

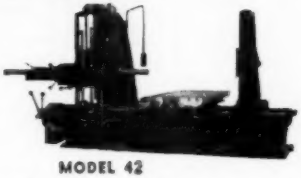
of horizontal boring, drilling, and milling machines



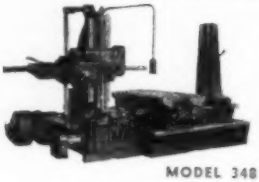
MODEL 460



MODEL 548



MODEL 42

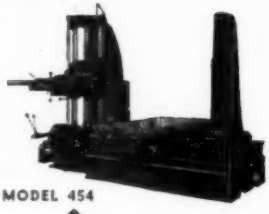


MODEL 348

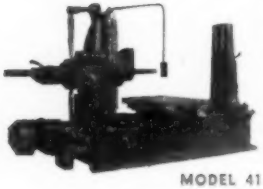
Well described as "one man machine shops", these versatile machines combine precision with ruggedness that makes them equally valuable for tool room work and as production machines.

Available with mechanical controls in 3" and 4" spindle capacities. Full directional remote electrical control models with 4", 5", and 6" spindles. Work ranges are from 36" x 36" to 94" x 84". Two or four way beds available in all sizes.

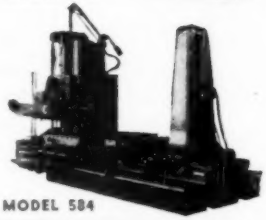
Fine feeds, high and low speed ranges to a single spindle, accurate spacing without jigs are among the features which make all Lucas models adaptable to many kinds of work and keep them in constant productive use in any shop. *Available with automatic power positioning dial indicators for repetitive, close tolerance work.*



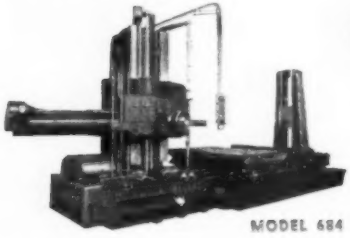
MODEL 454



MODEL 41



MODEL 584



MODEL 684

LUCAS OF CLEVELAND

LUCAS

Precision

HORIZONTAL BORING, DRILLING AND MILLING MACHINES
LUCAS MACHINE DIVISION, THE NEW BRITAIN MACHINE CO.
CLEVELAND, OHIO

TALKING SHOP

Tiny Horse

ULTRASONIC ENERGY can be concentrated to a surprising extent. Norman F. Barnes of GE recently reported that 1 kw of this high-frequency sound energy can be put into a 1-sq cm area, ten times the concentration of power in a white-hot tungsten filament (but only 1/10 that on the sun's surface). Ultrasonics are currently used in detecting flaws in castings and forgings; experiments indicate eventual use in mixing alloys.

Gripe Barometer

"AS LONG as the men gripe about the food in the cafeteria, we're having no labor trouble. If they shift to other things, we start to worry." That's the barometer one industrial relations man uses and told us about recently. Ties in with the fact that men will always gripe about food, as any service commander knows. Viz: A destroyer commander, on patrol duty in the Mediterranean just after World War I, decided to treat his command to turkey for Thanksgiving. After worriedly pacing the bridge during the feast, he espied one of the oilers staggering out on deck picking his teeth with his tongue.

"How did it go? Was the food all right?" he questioned.

The oiler looked him over, then grunted, "Too dam' much white meat."

Power Descaling

CATERPILLAR TRACTOR has mechanized removal of heat scale from valve tappets and increased production 800%. The lifters are 1 in. dia, 4 in. long, with an annular groove ⅜ in. wide and ¼ in. deep ½ in. from one end. This groove collected scale and was hand brushed at 50 per hour. With power-driven Osborn wire brushes, production has been increased to 450 per hour.

Newest Index

PRESENT complex business indices can now yield. Rossiter L. Seward, investment counselor of Rochester, N. Y., points out that the general level of business conditions and the water level in Lake Ontario seem to go up and down together. Water level went to a 60-year high in 1929. then in the early Thirties fell to the lowest recorded level. Seward explains it by pointing out that Lake Ontario is the final basin in the chain of the Great Lakes, draining a great agricultural area. Thus the water level in it is an accurate measure of the moisture conditions on farms. Good rainfall for several years makes farmers feel good and spend freely; dry years cause lower yield and curtailed spending. The level is receding now, but Seward calculates the low point in the cycle will come by next February, and the lake will start rising again. Want to trade your economist for a Rochester newspaper?

Daffynitions

TRUTH: what doesn't hurt—unless it ought to . . . FAULTS: what you should overlook in others, look over in yourself . . . PEDESTRIAN: driver who's found a parking place . . . PINK ELEPHANTS: beasts of bourbon . . . UPPER BERTH: where you rise to retire and get down to get up . . . UBANGI: the one human who can seal a letter with a kiss—after it's in a mailbox . . . PARROT TALK: polysyllables . . . MIDDLE AGE: when you think tonight of how you'll feel tomorrow . . . LECTURERS: traveling men who express themselves collect . . . JUNIOR LEAGUE: the heiresstocracy . . . POISE: art of raising eyebrows instead of the roof . . . BANKRUPTCY TRUSTEE: guy who succeeds when others fail . . . RECKLESS DRIVERS: automorons . . . STATESMAN: Congressman who would rather listen than talk . . . SALESMANAGER: fellow who grounds live wires . . . DEAD GIVEAWAY: radio quiz show . . . BARITONE: man who never got to first bass.

Bar Sandwich

BRIDGEPORT BRASS supplies a lot of the ground rods to utilities. These have a copper tube over a steel rod core, are chamfered at one end and equipped with a steel point at the other. The steel point is really a collar put over a neck turned in a turret lathe, the collar being held by rolling the tip of the turned portion back to form a point in the same machine. But the real trick is to get the copper jacket over the steel. Originally the steel was corrugated to provide a bond. But now the tube is put over the steel rod, and drawn down to get a tight mechanical bond. Laminated tubing (such as the aluminum-copper combination used in ammonia service) is made similarly, one tube being slipped over the other, then drawn.

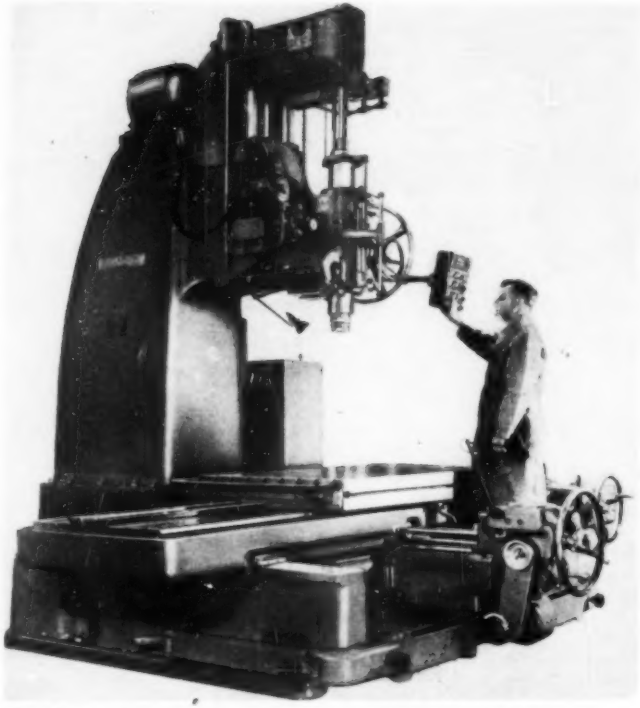
Extrusion

BRASS AND COPPER can be extruded to any shape, and for any purpose except one—electrical conductors. For this one service, involving resistance to torsion, bending and loading, "old-fashioned" drawn wire is better because its grain structure is more suitable. Incidentally, one authority on extrusion maintains that in five to ten years, all forms of structural shapes will be extruded rather than rolled, both because of the greater variety of alloys coming in and because of better materials available for extrusion dies.

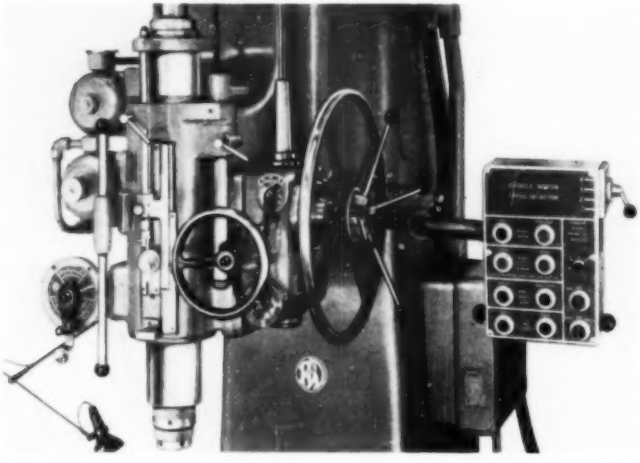
Goodby Chips

STRAY PARTICLES of core sand, chips and dirt are virtually impossible to clean out of cylinder-head and cylinder-block water passages. To prevent a small particle from getting between the mating faces when the heads are applied, Cadillac applies a water-soluble soap or grease to head openings, cleans the cylinder-block surface with chamois. Thus, the chances of having an engine lose compression through gasket blowby are practically nil.

New Shop Equipment



Pratt & Whitney machine provides 0.0001-in. accuracy with 2½-ton work load



Spindle, controlled from pendant panel (right), affords 30-1500 rpm range

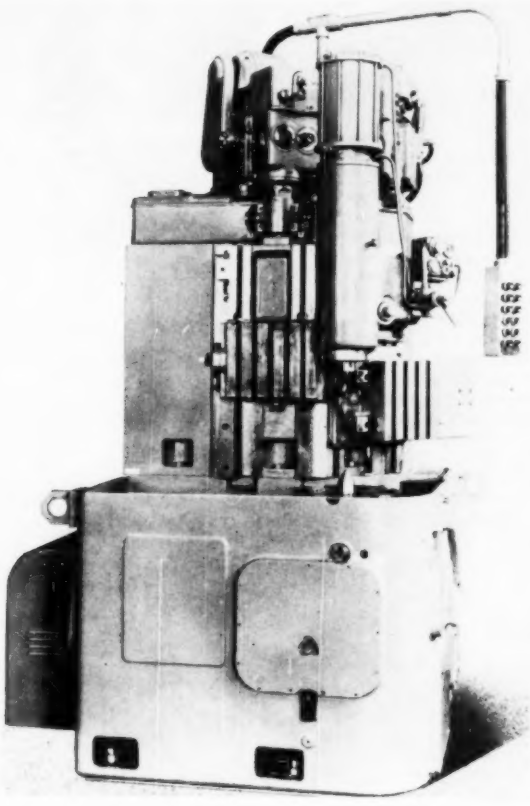
Accuracy Feature of King-Size Jig Borer

Vertical jig borer is a 15-ton precision machine capable of locating and boring to 0.0001-in. accuracy with a work load of 2½ tons. The No. 4E standard machine has a 36 x 72-in. rectangular table with 60-in. longitudinal travel and 36-in. traverse motion. Maximum standard height from table top to spindle nose is 33 in.; however, columns 6, 10, and 14 in. higher can be furnished. Combination rectangular and built-in 42-in.-dia rotary tables or built-in 48-in. rotary tables can be installed in place of the regular table.

Tools with No. 5 Morse taper can be held with collets and spindle-nose cap. The 5½-in.-dia hardened, ground, and lapped quill has 10-in. vertical travel with power feeds ranging from 0.0005-in. to 0.015 in. pre rev of spindle. An adjustable dial-indicator depth gage with positive stop is built into the spindle head. Pendant control station includes complete spindle control, longitudinal rapid power travel of table, and carriage and table power-milling feed selection with full range from 1 to 15 in. per min. A 3-phase, 50 or 60 cycle, ac, 3-hp motor and gear-reduction unit provides 12 spindle speeds ranging from 30 to 1500 rpm. Floor space required for the entire machine and control cabinet is approximately 12½ x 11 ft. Over-all height, using highest column, is roughly 12 ft.

Pratt & Whitney, Div. of Niles-Bement-Pond Co., West Hartford, Conn.

Materials and Parts



Vertical Production Lathe Built for Negative-Rake Cutting Tools

Reed-Prentice vertical automatic production lathe for turning, boring, and facing work has been developed to take full advantage of high-speed negative-rake cutting tools. The unit is controlled by a central cycle timer which, after work has been chucked, starts the spindle, starts each slide moving at its appointed time, and, when the last tool has completed its work, stops the spindle. Slides are independent of each other and may be set to go through their motions at any time during a machine cycle. Feed boxes permit traversing of tool to cutting position, feed, stop, dwell, return, and then stop for removal of workpiece.

All movements may be controlled by pushbuttons located in a pendant panel. A selector switch selects the slide to be moved; then the slide may be moved at a feed rate or rapid traverse in either direction as required. Tools may be fed into cut and actual work performed as a final check on correct tool set-up. The standard machine is equipped with one turning slide, one facing slide, and a tailstock which may be re-

...INCLUDING

Pantograph engraver reproduces patterns in ratios from 1 to 1 to full size to infinity and can work to 30-in. dia centers.....page 122

Pivot-blade shear has capacity of 18 ft of 3/16-in. mild steel at 50 strokes per min.....page 123

Face grinder with motorized spindle eliminates all pulleys and belts.....page 124

Two-ton hydraulic press is mounted on special inclined base to facilitate operator safety and loading.....page 126

Push broach facilitates single-pass operation in a variety of different materials.....page 128

Hydraulic bar feed and collet chuck mechanism is for continuous high-speed turning with carbide tools.....page 130

Portable milling machine cuts keyways up to 3½-in. dia. The unit is self-aligning.....page 134

...and in Jan. 9

Six-station transfer machine performs sixty drilling, reaming, and tapping operations on the sides and ends of cylinder and valve housings.

Stud-welding machine welds studs after finish plating or enameling without marking finish.

Horizontal drilling and tapping machine has a head that swivels 45° from the horizontal and is mounted on a column that swivels a full 360°.

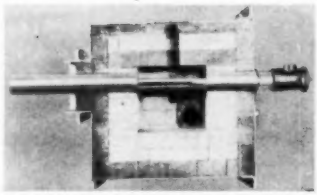
placed with boring head when needed. Addition of an extra slide, attachments for taper turning or forming and for other types of work can be supplied as required.

Reed-Prentice Corp., Dept. V-13, Worcester 1, Mass.

Carbide Heading Hammers Mark Bolt Heads

Combination bolt heading-and-marking hammers, for automatic bolt-heading machines, make it possible to eliminate the separate marking operation in the manufacture of bolts, rivets, and screws. Solid-carbide heading hammers are available with either male or female markings and in a complete range of sizes. Any pattern, numerals, combination of lines, or other markings can be furnished.

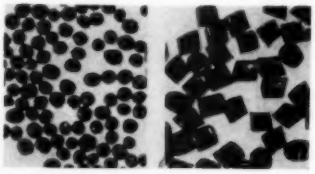
The Carboloy Co., Inc., Detroit 32, Mich.



Compact Atmosphere Generator Prevents Scale in Furnaces

Attached to any direct oil- or gas-fired batch or continuous furnace, this generator produces an atmosphere which prevents scale formation in soaking, normalizing, annealing, malleabilizing, or hardening operations. It also prevents scale formation on the surface of hot metal during subsequent hot-working operations. The generator consists of a simple refractory-lined steel chamber, fired by gas burner or electrically heated, through which a Lithium vaporizer tube runs. A cartridge of Lithium compound is inserted in the tube and heated. Carrier gas, also injected through the vaporizer tube, picks up the Lithium vapor and carries it into the furnace chamber. The carrier gas may be products of combustion from the furnace or other convenient generated gas. Protection against normal oxidation extends up to 2500 F during heating and against secondary oxidation to 2200 F during cooling. The work is said to come out clean and scale free.

The Lithium Co., 111 Sylvan Ave., Newark 4, N. J.

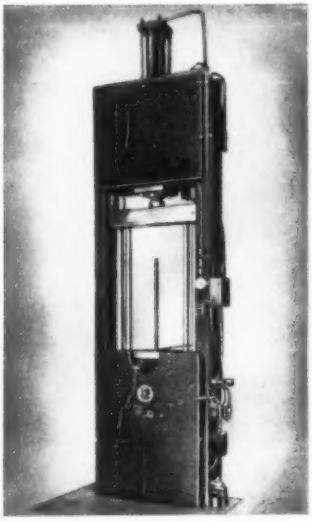


Steel Peening Shot Gives Longer Life

Genuine cut-steel peening shot has Rockwell hardness ranging from 46 to 52 and 270,000 to 300,000 psi tensile. This shot is reported to last from 20 to 30 times longer than ordinary shot during peening operations while providing greater arc-height and longer wear on equipment parts. Illustrated at right is shot as produced; at left after 1500 passes.

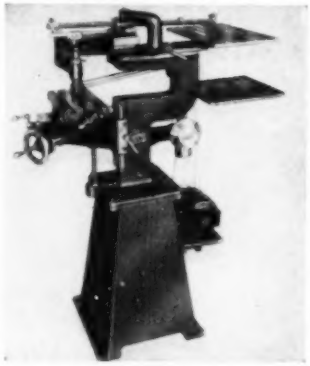
Steelblast Abrasives Co., 6536 Carnegie Ave., Cleveland 3, Ohio

Combination Press-Broach Is Hydraulically Operated



Designed for push-pull operations in either vertical or horizontal plane, combination press-broach is available in 25-, 50-, and 60-ton capacities. For broaching, tonnages can be varied from one ton to the capacity of the press. Ram stroke ranges from 7 to 54 in. A manually operated four-way valve permits instant and precise finger-tip control of the ram. The hydraulic system has a 20-gal. capacity reservoir which distributes through seamless steel tubes. Location of the pumping unit may be either in the base or the top of the machine. Cutting oil is supplied through an independently motorized coolant pump from a 15-gal. reservoir. For push broaching an adapter is screwed into the upper cross bar. The broach is inserted and held by a slot and key. For pull broaching a similar adapter is inserted in the lower cross bar.

K. R. Wilson, 215 Main St., Buffalo 2, N. Y.



Pantograph Engraver Spans 15 in., Affords Speeds to 1400 RPM

The open trough on the Panto-Engraver permits engraving and profiling in steel dies and molds to center of a 30-in. dia dial or 30-in. panel. Pantograph ratios from 1 to 1 to full size to infinity are available. Pantograph, cutter spindle, and spindle links are mounted in precision angular-contact ball bearings and a ¼-hp motor provides six cutter spindle speeds from 5000 to 14,000 rpm.

Standard work table is 6 x 12 in. with three T slots, but auxiliary work tables 18 x 24 in. with four T slots are available. Maximum work height is 6 in., cross feed, 6 in., and

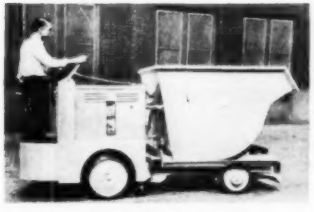
longitudinal feed is 6½ in. All dials are graduated in 0.001 in. Collets for the cutter spindle are available from 1/10- to ¼-in. dia for straight-shank cutters and standard tapered-shank cutters. The engraver can be furnished in either bench or floor models.

H. P. Preis Engraving Machine Co., 651 State Highway 29, Hillside 5, N. J.

Roller Conveyor Top Added To Portable Elevating Table

Held in place by a flange which encompasses the table perimeter, roller conveyor top facilitates movement of extra-heavy loads to and from the Portelvator elevating table. The conveyor may be installed or removed without tools. A wedge, placed between rollers at each end of the load, prevents the load from slipping during transit. A mechanical-lift arrangement on the Portelvator locks the table automatically at whatever height it is stopped. Height range is from 25 to 40 in. Load capacity is 2000 lb.

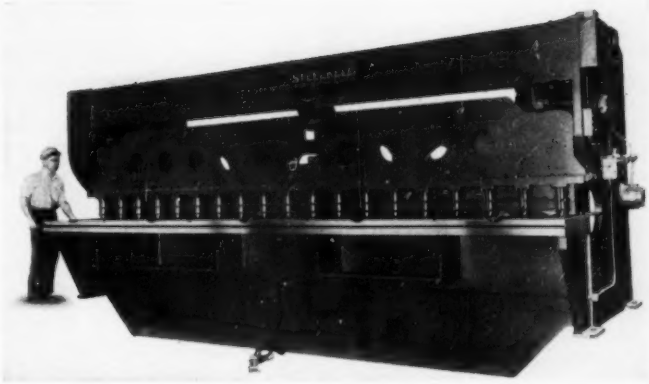
The Hamilton Tool Co., Hanover at 9th, Hamilton, Ohio.



Electric Dump Truck Holds 1½ Cu Yd, 6000 Lb

Designed for bulk handling, body of electric end dump truck dumps by gravity when released by means of a lever, convenient to the operator. Body dumps cleanly and returns to lever-latched position when emptied. Capacity is 1½ cu yd and 6000 lb.

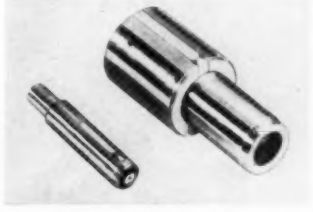
Mercury Mfg. Co., 4114 S. Halsted St., Chicago 9, Ill.



Steelweld Shear Cuts 18-ft, 3/16-in. Mild Steel

Shearing action is controlled by an electrically operated foot switch on the steelweld shear. Capacity is 18 ft of 3/16 in. mild steel at 50 strokes per min. The unit operates on a pivot-blade principle, eliminating customary guides and slides. Knife clearance is adjusted to suit thickness of work by turning a hand crank and observing a large dial indicator. When the hand is on the figure corresponding to thickness of metal being cut, the machine is ready to go. Frame and blade are of all-welded-steel, one-piece construction, with the heavy bed extending below the floor. A motor-operated back gage with slow and fast control buttons, located at the middle front of the machine, makes it easy to accurately position material to be cut. Back-gage indicator reads in inches and 1/64ths. Bed and crown are welded to end housings.

The Cleveland Crane Engineering Co., Wickliffe, Ohio

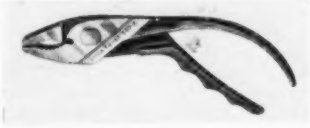


Blade-Contact Air Spindles For Column, Dial Precisionaires

Blade-contact air spindles facilitate instrument checks on practically any hole regardless of finish, interruptions, or size. Spindles consist of hardened-steel bodies, slightly smaller than minimum hole size, with hardened-steel contact blades either pivoted or floating. The latter action controls the flow of air through the jets. Blades may be of chrome, tungsten carbide, or other wear-resistant materials.

Spindles can be made with one or more blades and with different arrangements of jets and spring-loading as required for true- or average-diameter readings. Surface finishes rougher than 75 to 100 microinches can be measured accurately for out-of-round and taper as well as for diameter.

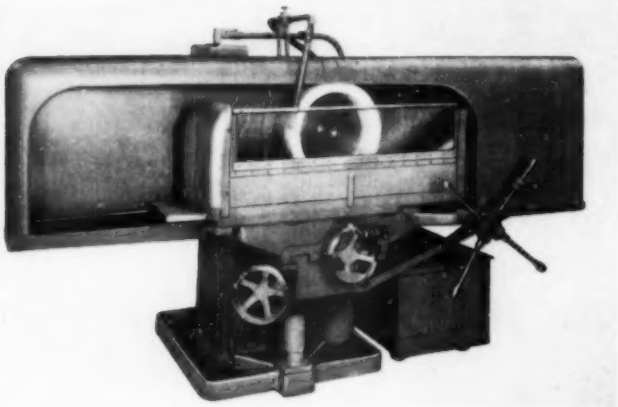
The Sheffield Corp., Dayton 1, Ohio



Slip-Joint Pliers Have Pistol-Grip Handles

Utica Tool No. 550 is a pistol-grip slip-joint combination plier, designed to reach hard-to-get-at jobs. Normal pull on handle is said to give more holding power for wire twisting or pulling. Retail price is $2.20.

Utica Drop Forge & Tool Corp., Utica 4, N. Y.



Face Grinder Equipped With Motorized Spindle

The 15-hp 900-rpm motorized spindle on this face grinder eliminates all pulleys and belts and is said to furnish exceptionally powerful drive. The spindle is mounted on pre-loaded ball bearings, and the unit incorporates box-type ways for maximum rigidity. A 13- x 36-in. work surface and 24-in. table travel facilitate wide range in face-grinding applications where flat, square, surfaces are required.

Standard equipment includes 18-in. wheel, complete coolant equipment with 16-gal. tank and table water guards. Cross-feed handwheel is graduated to 0.00025 in. for convenience in setting.

Abrasive Machine Tool Co., East Providence 14, R. I.

Interchangeability Provided In Chipping-Hammer Line

Handles, valves, valve blocks, throttle parts, and locking rings are all interchangeable with all barrels among the 15 models of the "Multi Power" chipping-hammer line. The five basic models (above) range from 1- to 3-in. piston stroke and each is adjustable to three combinations of speed and blow by simple modification. By employing the "Rotor Doughnut Valve" it is said that valve breakage has been virtually eliminated, as the piston passes through the valve assembly. Barrel breakage is also claimed to have been eliminated by advanced methods of honing and heat treatment.

The Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio

Dial Snap Gage Equipped With Two Radius Guides

For checking parts with fillets or for close-shoulder checking, the Nilco dial snap gage is equipped with upper and lower radius guides attached to the frame. Radius guides clear maximum fillet and permit close check, detecting any hour-glass condition for oversize fillet, resulting from breakdown of the grinding wheel when grinding. It is not necessary to rock the gage back and forth to obtain accurate readings. Specifically designed for checking crankshaft grinding, this gage has an indicator graduated in tenths. Rotable assembly facilitates extending the indicator back away from the work to clear any eccentric throw that might interfere with the gage.

Nelson Gage Company, Inc., Poughkeepsie, N. Y.

Whiteprinting Machine Prints Up to 24 fpm

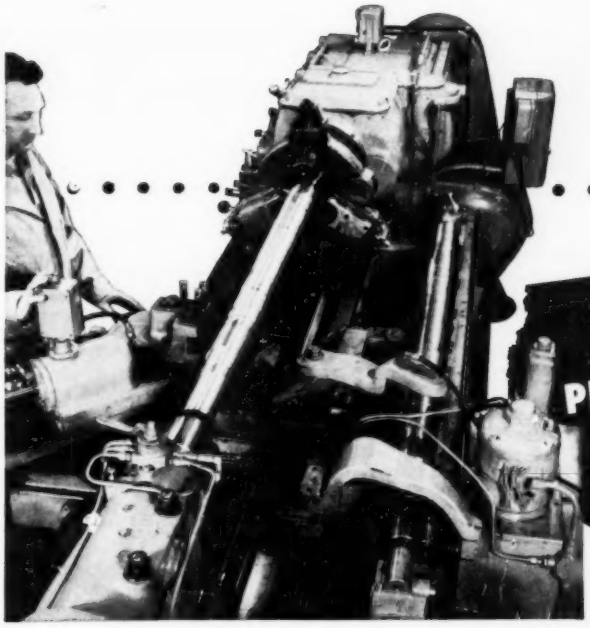
Model 50 whiteprinting machine has variable printing speeds up to 24 fpm and under actual working conditions can produce 10,000 sq ft of prints a day. The machine copies drawings, documents, and any other work that has been drawn, printed, typed, or written on translucent or transparent material. BW prints with black, red, brown, or blue lines on light, medium, or card-weight white papers, medium-weight pink, yellow, blue, or green-tinted papers, transparent papers, cloth, and film can be produced on these machines.

Charles Bruning Co. Inc., 4754 Montrose Ave., Chicago 41, Ill.

Electric Tube Welder Eliminates Transient Zone

Electric resistance welds that may be flash welds, butt welds, or modifications thereof, are produced by the Borgadt electric tube welder. Surface contact conveys the current across the seam cleft in preformed tubing to fuse the metal. The weld, in most cases, is said to be of fine grain equal or better than the parent metal, and is free from transient-zone discolorization adjacent to the weld, recurrent welds, and inclusions. Low resistance of the welding circuit keeps required current at a minimum.

J. B. Borgadt, 2036 E. 86th St., Cleveland 6, Ohio.



. . . . . You . . . CAN BE IN THIS PROFIT PICTURE—WITH AIR-GAGE TRACING

Size—shape—quantity; you can't stump the Monarch "Air-Gage Tracer" on any of these.

Here's why it's tops among tracer-controlled lathes when it comes to versatility.

The "Air-Gage Tracer" is:

1—Applicable to all sizes of Monarch Lathes, from the 10″ to the 32″.

2—Able to employ either a flat or a round template.

3—Adaptable for use on any length machine. The Type C (illustrated above) is recommended particularly for extra long work.

4—Equally proficient for contour turning, boring and facing—and for multiple diameter work, including step shafts.

5—Available in conjunction with variable feed and rapid traverse return as a Packaged Unit, which provides a completely automatic cycle as a further boost to production.

The results shown for the job illustrated are typical of what you can expect with an "Air-Gage Tracer". May we show you how this faster, better method of tracer-controlled machining fits into *your* profit picture?

The MONARCH MACHINE TOOL Company
SIDNEY, OHIO

JOB FACTS

Part—SAE 1045 shaft

Size—$7\frac{31}{16}$ x $4\frac{1}{2}$ Max. Diam.

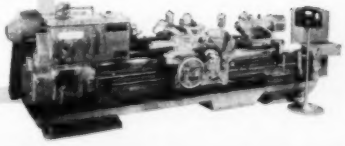
Tolerance—+.000″—.002″

Operations—Turn complete. (16 Diams. & 4 Chamfers)

Feed—5″/min. on diameters to be ground; 2″/min. on all others

Machine—20″ Monarch Model M Engine Lathe with "Air-Gage Tracer" Packaged Unit

Machining Time—26.01 Minutes



ACCURACY · ECONOMY · LONG LIFE
Monarch TURNING MACHINES

FOR A GOOD TURN *FASTER* — TURN TO MONARCH

Pyrometer Determines Surface, Sub-Surface Temperatures

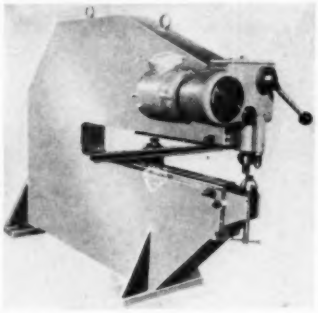
Providing a 4-in. direct-reading indicator, mounted in a rubber-cushioned housing the Pyro surface pyrometer determines surface and subsurface temperatures. Models offer either rigid extension arm or a long 42-in. flexible arm suitable for use with one or more of a selection of eight types of thermocouples. Each model is available in four temperature ranges from 0 to 400 F to 0 to 1200 F.

The Pyrometer Instrument Co. Inc., Bergenfield, N. J.

Gearhead Motor Available in Single-, Double-Reduction Units

Basically a standard motor with self-contained gear-reduction mechanism, the gearhead motor is available for single- and double-reduction requirements in ratings from 1/200 to 1/3 hp. Reduction ratios range from 6:1 to 900:1 and input torques from 1 to 500 in.-lb. Countershaft speeds range from 833 to 8 rpm. Depending upon the motor frame size employed, the countershaft can be located in increments of 30 or 90° relative to a horizontal centerline.

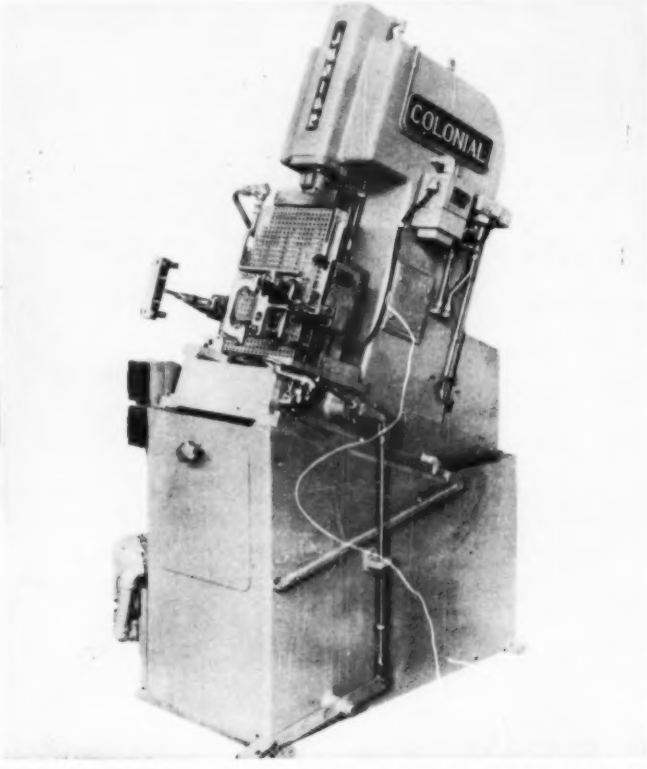
Robbins & Myers, Incorporated, Springfield, Ohio



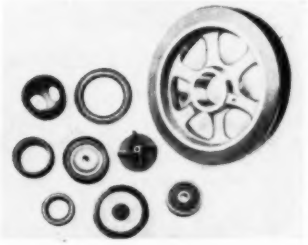
Sheet-Steel Cutting Machine Folds, Beads, and Slots Too

Pullmax Model P-5 sheet-steel and plate cutting machines are capable of straight, circular, and irregular cutting, in addition to folding, beading, and slotting. Circle- and straight-cutting attachments have quick-locking devices that permit size changes in one movement. Edge-cutting capacity ranges from finest gages up to 7/32 in. in mild steel. Circles from 3 5/32-in. to 40-in. dia can be cut and the unit has a throat depth of 42 in. The mechanism is entirely enclosed and operated in an oil bath.

The American Pullmax Co., Inc., 2627 North Western Ave., Chicago 47, Ill.



COLONIAL JUNIOR 2-ton 12-in.-stroke hydraulic press is mounted on a specially fabricated inclined base and incorporates a hinged guard screen to cover moving parts during operations. Extra loading convenience and operator safety are the big features. Both ends of automotive door handles are broached, two at a time, during the machine cycle. Coolant nozzles are semi-permanently attached to guard screen and connected to the piping with a ball joint in line with the screen hinges—*Colonial Broach Co., Box 37, Harper Station, Detroit 13, Mich.*



Rubber-to-Metal Bonding

Acushnet rubber-to-metal bonding is said to combine the best properties of metal and rubber (natural or synthetic) in one bonded unit to provide strength, toughness, resiliency, shock absorption, sound abatement, electrical insulation, corrosion resistance, vibration suppression, and protection against abrasion. Several methods are used to bond rubber to metal.

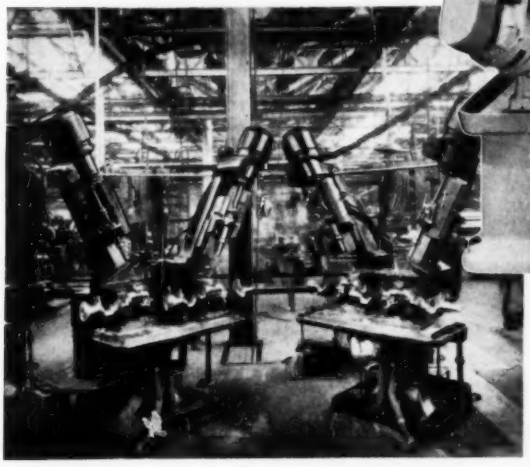
Acushnet Process Co., New Bedford, Mass.

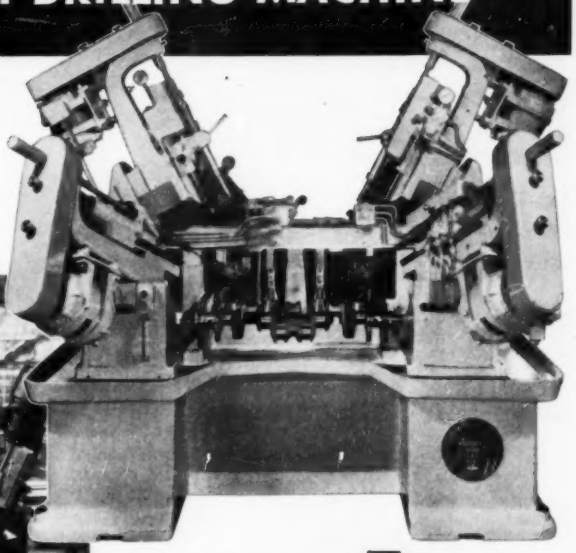
1 NEW LELAND-GIFFORD CRANKSHAFT DRILLING MACHINE

REPLACES

3

TWENTY-YEAR-OLD MODELS





and SAVES 5 WAYS

1. **SAVES PRODUCTION TIME** — one operator easily drills 132 shafts in 8 hours.
2. **SAVES ERRORS** — drills all six holes at once ... no possibility of undrilled holes.
3. **SAVES WORK HANDLING** — 80-pound shafts handled once compared to 6 times in 3 machines... 18 tons less lifting in 8 hours.
4. **SAVES OPERATOR'S TIME** — for burring, drill sharpening and other secondary operations.
5. **SAVES VALUABLE FLOOR SPACE.**

The battery of three dual-spindle machines (shown directly above) was installed in 1932. It has paid for itself many times over by drilling more than 720 miles of ¼" crankshaft oil holes. Still capable of many thousand more holes, these old machines have been replaced by one new six-spindle unit (top right) which offers advantages too good to pass up. Are old drilling machines depriving you of benefits sorely needed today?

Write for Complete Information

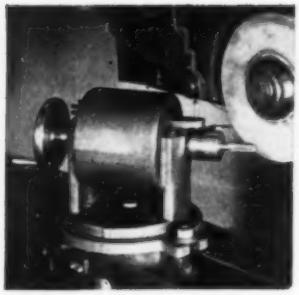
PRODUCTION MEN
Get This Handy Slide Rule

A valuable aid in figuring costs and setting production schedules. Quickly gives time required to drill holes of any size and depth in any material. It's free. Write the nearest office.

LELAND-GIFFORD
Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.

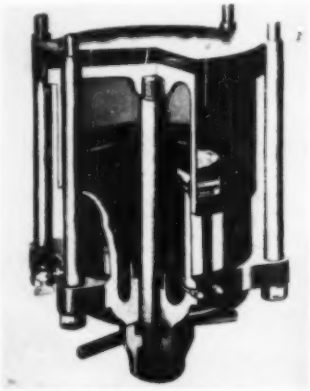
CHICAGO 6, 565 W. Washington Blvd.; DETROIT 26, 1533 Dime Bank Bldg.; CLEVELAND 1, P. O. Box 5547; NEWARK 2, Industrial Office Bldg.; ROCHESTER 4, Commerce Bldg.; LOS ANGELES 14, 724 So. Spring St.



Tap Sharpener Based on Cam-Operated Principle

Car-Anth sharpener handles any 2-, 3-, or 4-fluted taps with shank sizes up to ½ in. Based on a new cam-operated principle, it will sharpen tap leads to the correct angle with the correct amount of relief to assure clean cutting of threads.

Car-Anth Mfg. and Supply Co., St. Louis 8, Mo.



Die-Cushion Cylinder for Deep Drawing, Forming Dies

Equipped with a hardened and ground pin pressure pad to receive pressure pins that pass through the bolster plate, this die-cushion cylinder is adaptable for both deep-drawing operations and for pressure-pad control of forming dies. A handwheel adjustable nut which arrests pin pressure pad at any given position rise of the pad, compensating for bolster plate thickness variation, sharpening or grinding of the dies or other adjustments. Installation requires merely drilling and tapping four holes in the bolster plate. Cylinders in six sizes from 4 to 16 in. have draw-ring holding pressure on 100-lb air line from 1 to 15 tons.

Dayton Rogers Mfg. Co., 2824-13th Ave. South, Minneapolis 7, Minn.

Liquid Casting Plastic Checks Machine Surfaces

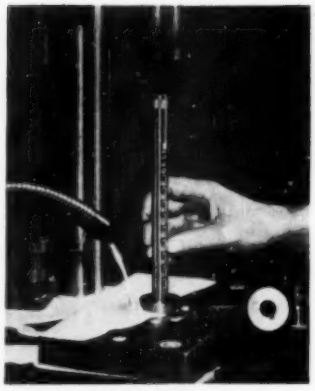
Marcokit No. 249, surface-checking kits contain a pint of casting resin and the proper amount of catalyst to cause the resin to solidify in approximately 15 min. The catalyzed resin is poured against the surface to be checked and removed when hard. It is said to provide an accurate and permanent record reflecting the surface conditions of the machined piece.

Marco Chemicals, Inc., Sewaren, N. J.

Cutout Provides Protection For Pressure Gages

Model DV15-200 was designed to meet the demand for positive automatic protection of all gages in a multi-gage pressure system and to eliminate the necessity for manually shutting down each gage in the system when that gage is not used. The cutout is made in two series; one ranging from 30 to 300 psi, and one from 400 to 3000 psi.

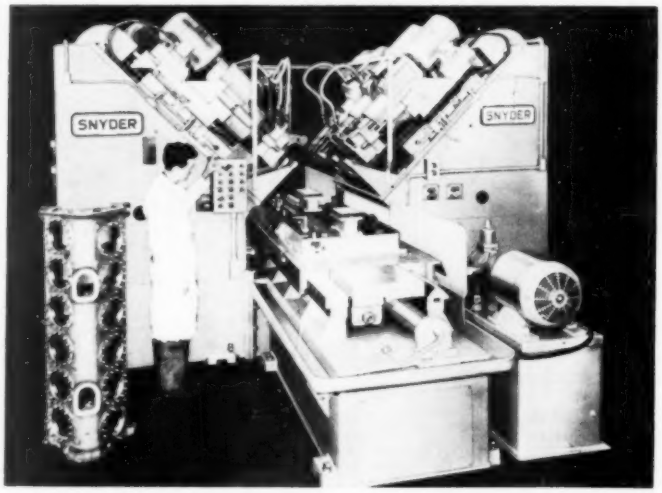
Greer Hydraulics, Inc., 454 18th St., Brooklyn, N. Y.



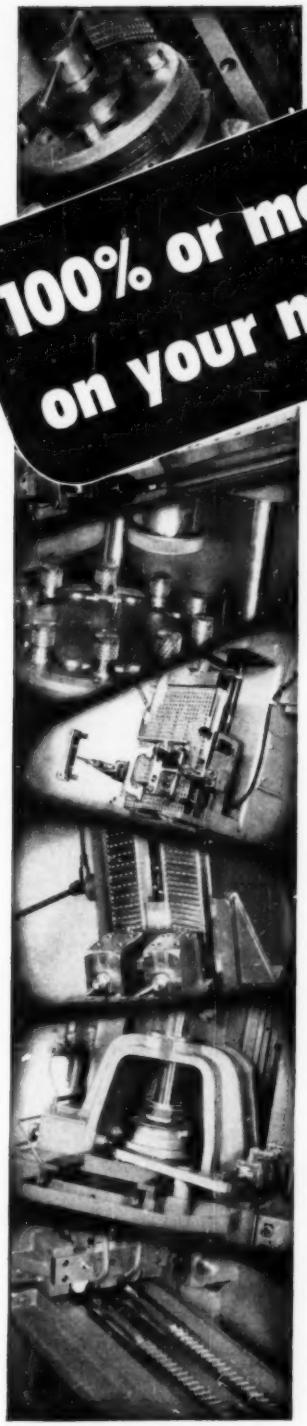
Push Broach Facilitates Single-Pass Operations

The LK broach, for production operations, incorporates a special tool design which facilitates single-pass broaching in many different materials. Illustration shows broach cutting a 3/16-in. wide x 3/32-in. deep keyway in a cold-rolled steel workpiece. Production on this job is approximately 250 pieces per hr. A single pass of the broach through the work piece cuts the keyway, and secondary operations are eliminated. Two-ton pressure is required to push the broach through the workpiece.

Kase Machine Co., 1822 Buffalo Ave., Cleveland 19, Ohio



ELEVEN-STATION line-index hydraulic-feed machine drills, counterbores, and taps 168 cylinder stud holes at a 90° angle in large aluminum crankcases. Cycle time is 2 min 19 sec, without loading and unloading. The machine is entirely automatic after loading, and can be operated by unskilled help. Power is supplied by five 7½-hp motors and two 5-hp motors—*Snyder Tool & Engineering Co., Detroit, Mich.*



100% or more per year on your money....

Rare is the broaching installation engineered by Colonial that doesn't return its original cost within a year—through lower cost per piece produced. Some recent ones have returned their original cost several times over during their first year of operation.

There is a good reason for this. Not only is broaching—internal or surface—just about the fastest method there is of removing metal, but in the case of Colonial installations there is no guess work. Colonial installations are complete and integrated.

. . . and safe too!

Colonial takes the responsibility for the WHOLE JOB—machine, tools, and fixtures.

When you get Colonial broaching equipment you get the RIGHT COMBINATION of the proper machine, and correctly designed broaches and fixtures for YOUR particular jobs—complete and ready to run.

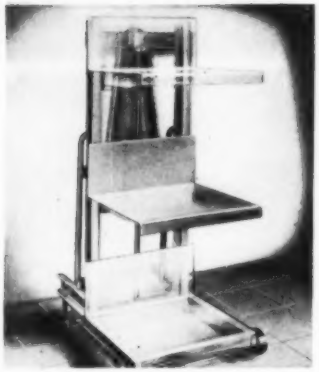
Colonial can tell you—in advance—almost exactly how much your costs will be cut.

You can't beat that kind of an investment.

PIONEERS OF H.S.S. BROACHING

COLONIAL

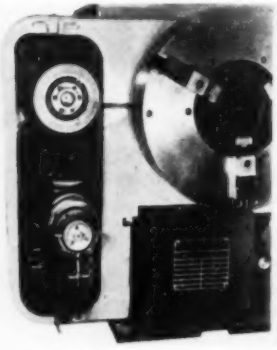
BROACH CO. DETROIT 13



Hamilton Stacker Lifts 1000 Lb to 58 In.

The Portelevator stacker is of fabricated construction and utilizes the Portelevator lifting principle. Platform automatically locks at any position and does not slip or settle under the load. Platform size is 26 in. across and 24 in. in length. Load capacity is 1000 lb, maximum height 58 in., and minimum, 6 in. Platform movement is accomplished through hand crank, roller chain, meshing bevel gears, and screw. Weight of unit is 328 lb, and floor lock is standard equipment.

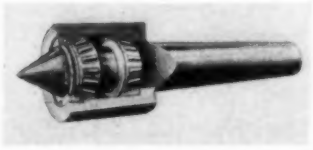
The Hamilton Tool Co., Hanover at Ninth, Hamilton, Ohio



Speed-Control Unit Employs Vari-Pitch Sheave

A combination of Vari-Pitch automatic sheave, companion sheave, wide-range Texrope belts, and Texslide motor base have been developed into a speed control for applications requiring frequent speed changes. The unit is adaptable to various machine tools such as lathes and pipe-threading machines, and facilitates speed adjustments without shutting down the drive. It is said to assure easier and smoother starting and is for motion-control speed change ratios up to 2 to 1. Speed variances of the driven machine are obtained by turning the adjusting screw on the Texslide motor base with any commercial wrench. The new sheave accommodates standard motors from 1½ to 40 hp with motor speeds from 900 to 1800 rpm.

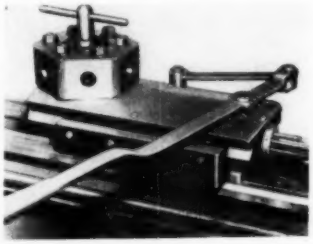
Allis-Chalmers, Milwaukee, Wis.



Live Center Handles 2400-lb Loads at High Speed

Two matched Timken tapered roller bearings in the Scully-Jones live center have eccentricity points aligned for perfect anti-friction rotation. Carrying capacities to 1000 lb in the No. 1, 2, and 3 Morse Taper sizes and up to 2400 lb in No. 4 and 5 Morse taper sizes are reported. The unit is equipped with threaded retainer rings to preload bearings. The point is ground after assembly to guarantee holding run-out to within 0.0002-in. total indicator reading. Grease port with ⅛-in. pipe thread in the rear of the shanks for standard hydraulic grease fitting.

Scully-Jones & Co., 1901 South Rockwell St., Chicago 8, Ill.

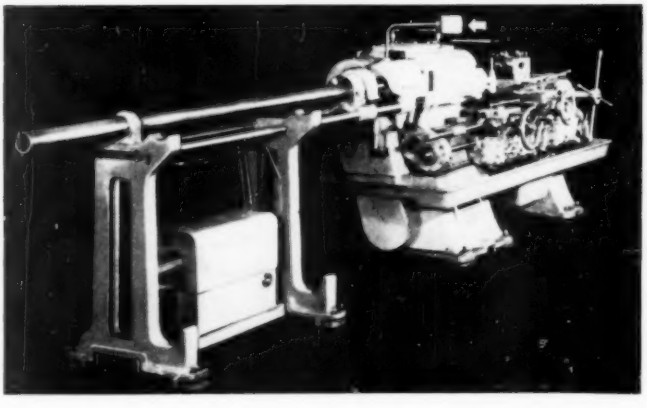


Enco Hexagonal Turret Fits 9- to 12-in Lathes

Adaptable to all lathes from 9- to 12-in. swing, the Enco lever Hexturret can be furnished with 4½- or 6½-in. working travel. Among the features of this unit are hand-scraped-and-spotted bearing surfaces, hardened indexing mechanism and rigid top-side clamping. Turret is particularly adaptable for close tolerance work in plastics, aluminum, brass, and mild steels.

Enco Mfg. Co., 4522-24 West Fullerton Ave., Chicago 39, Ill.

HYDRAULIC BAR FEED and collet chuck mechanism is for continuous high-speed turning with carbide tools. Single-lever control panel (arrow, close-up at left) provides finger-tip control of the complete cycle for the operator. This mechanism can be installed on any Jones & Lamson No. 3, 4, 5, 7, or 8 universal turret lathe at the factory or in the field.—*Jones & Lamson Machine Co., Springfield, Vt.*



4-WINGED DRIVER CAN'T SLIP OUT OF PHILLIPS TAPERED RECESS

FOR A SHARPER IMAGE OF

TOP PROFITS IN TELEVISION PRODUCTION and SALES

... set-builders use

AMERICAN PHILLIPS SCREWS

SEE NEW PRODUCTION PROFITS: Assembly of costly television sets puts a prohibition on spoilage. That's why American Phillips Screws are used, to help keep sets rolling out to an eager market, and to keep rejections down. No delays or losses, then, and output hits the main channel with highest return per man-hour, *which means time-savings up to 50%!*

SEE NEW SALES-STIMULATION: Smoothly finished, unmarred cabinet work is the basis of television-set sales. And that's the way sets come from an assembly department using *American Phillips Screws.*

Does YOUR product have this double-feature of production-economy and sales promotion? Then write:

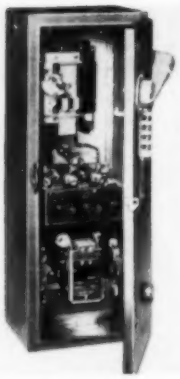
AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND

Chicago 11: 589 E. Illinois St. *Detroit 2:* 502 Stephenson Building

AMERICAN PHILLIPS *Screws*

ALL TYPES

ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)



Polyphase-Motor Starter Features Safety, Simplicity

A circuit-breaker operating mechanism in this starter for polyphase motors is said to assure maximum operator safety. An interlock prevents opening the door when breaker is on, although authorized persons can gain access for inspection without power interruption. Straight-line guided vertical motion of the armature and movable contact assembly eliminates bearings reducing wear. The unit is designed for control of 1- to 100-hp motors. Mounting and wiring conform to new NEMA standards providing added flexibility.

Square D Co., Industrial Controller Division, 4041 N. Richards St., Milwaukee 12, Wis.

Magnetic Ground Clamp For Electric Welders

The MagnaGround permanent Alnico magnet is a clamp for the ground cable of electric welders, and is capable of handling 600 amps. It is attached to the cable with set screws or silver soldering and is claimed to reduce amperage needed by providing a positive ground. It can be applied on any vertical or horizontal magnetic surface.

Dings Magnetic Separator Co., 4740 W. Electric Ave., Milwaukee 14, Wis.

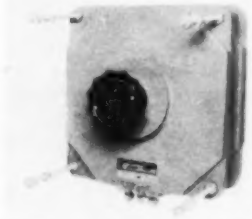


Plate-Type Rheostat Provides Adjustable Stops

For field control of dc shunt or compound motors, self-excited generators, exciters, separately excited generators, and synchronous motors, this rheostat is furnished in three forms. The 6-in. model has 27 resistance divisions; the 9-in., 52 resistance divisions, and the 12-in. unit, 70 resistance divisions. Stops, adjustable through a 90° angle, limit the dial switch movement at each end of travel. Handwheel operating mechanisms and sequence drives allow two plates to be operated in sequence by the rotation of a single hand wheel through approximately two revolutions.

General Electric Co., Schenectady 5, N. Y.

Power Units Added To Barrett Electric Trucks

Gas-electric Ready Power Units in the Barrett Power Ox line of electric lift trucks, pallet trucks, and tractors, provide a power supply that delivers maximum voltage 24 hours a day.

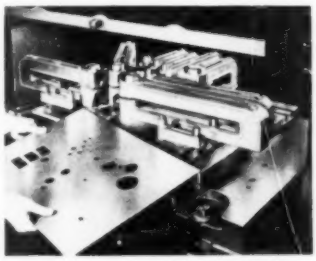
Walking speed control gives three variations for each available speed permitting the right speed for "inching" the load in confined spaces. Illustrated is a Barrett Power Ox equipped with a Ready-Power "Z-12-5" unit.

Barrett Cravens Co., 4601 S. Western Blvd., Chicago 9, Ill.

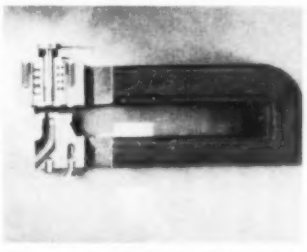
Wales Notching System Eliminates Single-Purpose Dies

Wales self-contained units for perforating and notching sheet metal eliminates expensive single-purpose dies. Here's how the system works. A master templet placed on the press bed, has pilot pin holes located in the same pattern as the preforations in the finished piece of work. Set-up templets, marked with the operation number and punch size, are placed on top of the master templet to identify the pilot pin holes. The number of operations on each part depends on the quantity, size and position of perforations. Before development of this system it was generally necessary to build completely a new die for each pattern. Now wales units can be used and reused on unlimited set-ups on the master template. Setting up a new pattern is merely a matter of drilling new pilot pin positions on the master templet. The system operates on both stamping presses and press brakes.

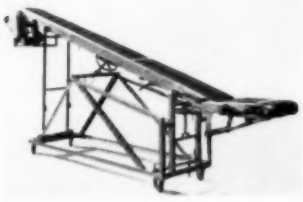
Wales Strippit Corp., North Tonawanda, N. Y.



Set-up of punching units and the pattern of holes punched by it



Cut-away view shows inner workings of individual punching unit



Sage Portable Belt Booster Is Floor-to-Floor Conveyor

Available with belts 6 to 36 in. wide in lengths of 12, 15, 18, 20, and 24 ft, the Sage Portable Belt Booster is primarily a floor-to-floor conveyor and stacker. Various motor capacities are available and either slider or roller bed construction is offered. Units are made with power-driven tail feeder and wheel, roller gravity section, or nosed-over delivery.

Sage Equipment Co., 30 Essex St., Buffalo 13, N. Y.

Why HUNT RABBITS with a TANK?

on Most Jobs a KRW 100-TON PRESS WILL EQUAL HEAVIER, COSTLIER, EQUIPMENT and SAVE YOU MONEY!

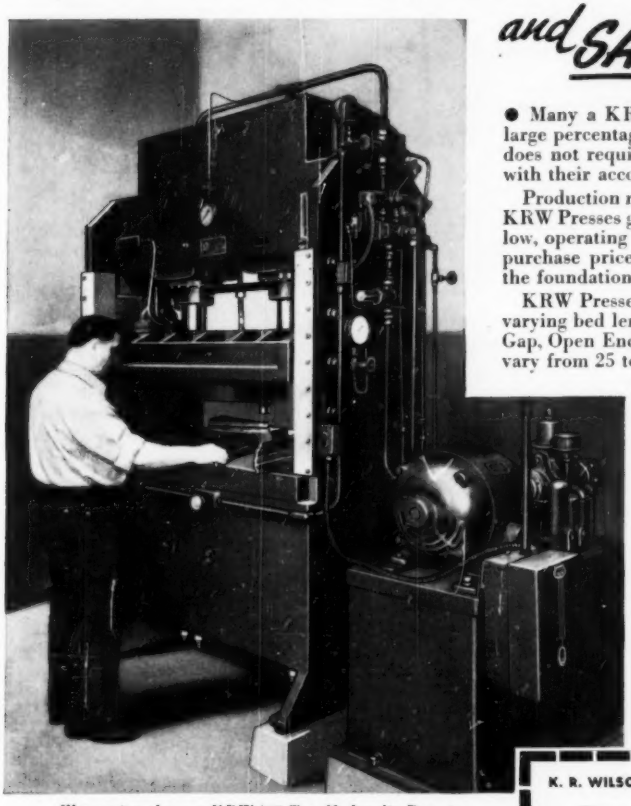


Illustration shows a KRW 100-Ton Hydraulic Press in plant of Elrae Pressed Metals, Inc., Buffalo, N. Y. When the picture was taken, bicycle parts were being formed.

● Many a KRW Press user discovered long ago that a large percentage of forming, drawing and stamping work does not require the use of large, heavy-tonnage presses with their accompanying high initial and operating cost.

Production records, in a variety of industries, show that KRW Presses greatly reduce costs. First investment is very low, operating costs are still lower. In one instance, the purchase price of a KRW Stamping Press was less than the foundation cost for heavier equipment.

KRW Presses are highly flexible...they can be built in varying bed lengths. KRW Presses are available as either Gap, Open End or Closed End Types. Tonnage pressures vary from 25 to 100 tons. Because they are hydraulically operated and not mechanically driven, they are quiet and vibrationless in operation. Platens can be stopped and reversed at any point in their travel.

Let us know your needs...we are fully equipped to engineer our equipment to handle your work. In the majority of cases, we can make delivery in a fraction of the time required for other type presses. Let us hear from you.

ALL TYPES OF DIES. We are equipped to engineer and build dies to meet your specifications. All we need is available technical data, blueprints and, where practical, a sample piece of work. We'll quote prices and delivery date.

K·R·WILSON

215 MAIN ST. · BUFFALO 3, N. Y.

K. R. WILSON, 215 Main St., Buffalo 3, N. Y.

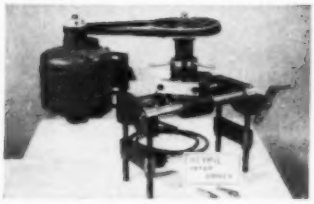
Please send me complete information on new KRW 100-ton Hydraulic Presses.

Name_____

Address_____

City and Zone_____ State_____

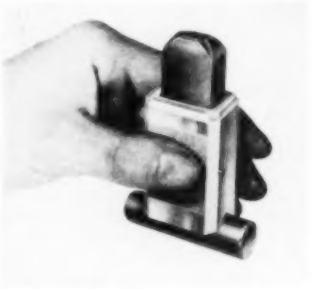
11



Portable Milling Machine Cuts Keyways up to 3½-in. Dia

The Keymil end-mills keyways in shafts from ⅝- to 3½-in. dia. Keyways from ⅛- to ¾-in. width, 1/16 to ½ in. deep, and 6 in. long can be cut. The unit is self-aligning, and can be driven by motor, drillpress or by electric or pneumatic drills of moderate speed. Small keyways may be cut with one pass and larger ones two or more passes. The Keymil including 110 v, 60 cy motor, pulleys, V-belt, bracket and clamp, switch and 6 ft of cord is priced at $210.

Keymil Mfg. Co., Mechanicsburg, R.D. 3, Pa.



Stamp Holder Cast From Light-Weight Aluminum

The Luminum-Line Set-Rite stamp holder for solid-steel hand stamps is cast from rough, light-weight aluminium. Sides are knurled to assure absolute grip, and the holder bottom features a "V" slot to permit positive setting. The unit is for marking rounds, flats, and other industrial shapes.

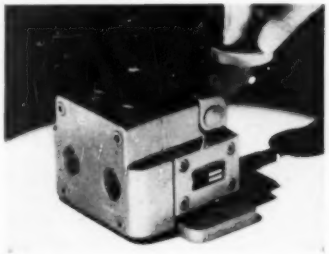
M. E. Cunningham Co., 95 E. Carson St., Pittsburgh 3, Pa.

Unusual Properties Obtained In Steel for Plastic Molds

Samson Extra, alloy steel for plastic mold cavities and force plugs, is said to provide excellent hobbing qualities and good machinability with high core strength. Maximum Brinell hardness is about 105. In a test to determine hobbing qualities, a mold blank of 1¾-in. dia and 2¼ in. long was used. A hob of 0.91-in. dia, tapered 0.045 in. per in., was sunk into the mold blank using a 110-ton load with one push. A 0.71 in. cavity was obtained.

Yield strength of the steel when oil quenched is reported to be double the 38,000 psi of good grade of hobbing iron. Average properties after case hardening are as follows: With oil quench case hardness is Rockwell C-64, core hardness Rockwell C 20, tensile strength of core 118,000 psi, and yield strength 69,000 psi. With water quench case hardness is Rockwell C-65, core hardness Rockwell C-25.

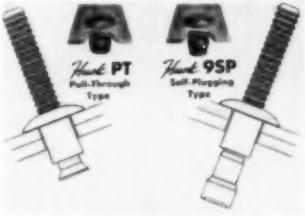
The Carpenter Steel Co., Reading, Pa.



Fast-Cycling Valve Provides Four-Way Directional Air Control

Model NHS actuates single- or double-acting pneumatic cylinders and other air-operated equipment. Valve action is almost instantaneous and four-way directional air control is provided. The valve is available in ½- and ¾-in. sizes for use with air-line pressures of 25 to 150 psi. The valve can be mounted in any position, so long as the operating piston is in a horizontal plane.

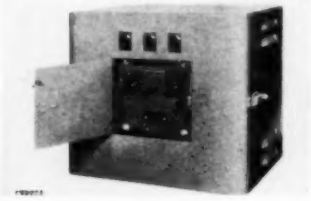
Hannifin Corp., 1118 South Kilbourn Ave., Chicago 24, Ill.



Blind Rivets Have No Minimum Grip Limitation

Huck Pt pull-through and 9SP self-plugging blind rivets are available in ⅛-, 5/32-, 3/16-, and ¼-in. dia. They are regularly furnished in aluminum alloys or cadmium-plated mild steel with brazier or 100° countersunk heads. Pull-through rivets have no minimum grip limitation, and the self-plugging type have a grip range of 0.140 in. for any grip increment. The pin tail of the rivet is provided with pull grooves to assure positive driving. The rivets are driven by a single operator with a manual or pneumatic pull gun and require access to only one side of the work.

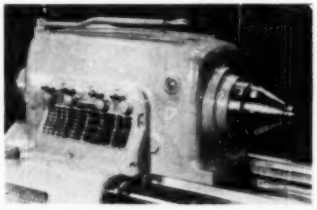
Huck Mfg. Co., 2480 Bellevue Ave., Detroit 7, Mich.



Weld Energy Comparator Gives Visual, Audible Signal

Comparator can be used with any Westinghouse single-phase spotwelding control. It is provided with a sensitivity adjustment which may be set to any value required for the work. Signals may be visual, audible, or both. The unit detects changes in line voltage and changes in duration of welding current.

Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa.



Lever-Operated Collet Attachments For Monarch Series 60 Lathes

For application on Series 60 engine and toolroom lathes, this lever-operated collet attachment provides up to 1⅛ in. round bar stock capacity. It can be used with either draw-in or pusher-type collets. Both attachments are identical except for the drawbar, collets, and spindle-nose adapter, thereby assuring quick conversion from one type collet to the other.

The Monarch Machine Tool Co., Sidney, Ohio.

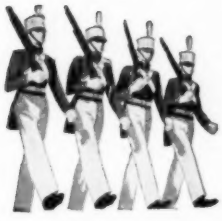
THE

Constant Uniformity

of Mueller Brass Co.

RED TIP* ROD

is the secret ingredient that keeps your manufacturing costs low!



The constant UNIFORMITY of Mueller Brass Co. Rod saves tools, grinding, and "down" time. Brass Rod users throughout the United States and abroad know this and they continue to use it year after year. THEY ARE ACTUALLY PINNING MORE PROFIT TO THEIR COST SHEETS.

Do you need a many-purpose Brass Rod or—a Brass Rod for one special purpose? Mueller Brass Co. Red Tip Brass Rod is a rod of a thousand uses. You can use it for almost any purpose and it is exceptionally free-cutting and consistently uniform.

The chemical composition, structure, temper and mechanical properties of Mueller Brass Co. Red Tip Brass Rod are so closely controlled that no perceptible variation in machinability can be noted from one batch of rod to another.

If you want brass rod for some special purpose, such as knurling, deep drilling, thread forming, or for bending, expanding or flaring, we make that, too, and we invite your inquiries.

Do you want more efficient production or better performance? Is a special alloy the answer? If you have a problem, tell us about it. Our Technical Engineers and Laboratory are at your disposal.

Mueller Brass Co.

Streamline®

PRODUCTS

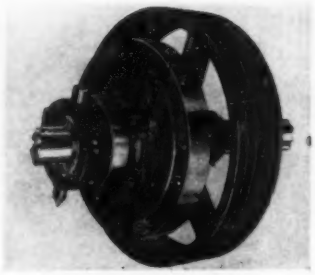
Port Huron, Michigan

Aircomatic Welding Process Gives High-Speed Deposition

The Aircomatic welding process consists of the continuous feeding of a coiled-wire electrode in a gaseous shield through the barrel of a welding gun. High-speed continuous deposition of filler metal is possible in all positions with a completely visible arc. Both manual and automatic equipment are available. The process has been successfully applied to aluminum, chrome nickel, stainless steels, and aluminum bronzes.

When using 1/16-in. wire, deposition rates in the downhand position of 15 lb per arc hr are possible. There is no stopping to change electrodes and no stub loss. Three-eighths-in.-thick square-edge plates can be welded without further edge preparation, by putting in only two passes.

Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.



Clutch Design Incorporates Worthington QD Sheaves Rim

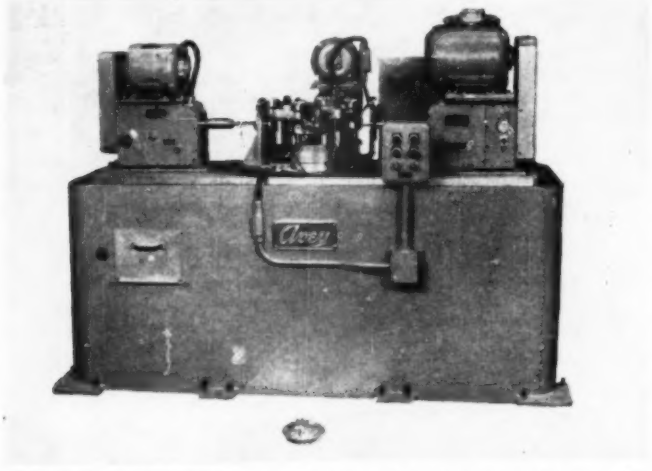
Installed between motor and driven machine, the Edgemont clutch mechanism is a standard Edgemont gear-tool drive, known as Type FS, for starting and stopping the flow of mechanical power. It is standardized on Worthington QD sheave rims for V-belt drive applications in A, B, C, and D sections where a clutch is desirable. To assemble the sheave on the sleeve it is only necessary to remove the grease fitting, place the sheave over the taper, and use the built-in pull-up bolts to draw the sheave snugly into place. To demount the sheave, the same bolts are used as jack screws in taps provided for that purpose.

The Edgemont Machine Company, Dayton, Ohio

60-lb Sandblaster Produces High-Velocity Stream

For cleaning small steel fabrication or large castings, 60-lb Sandaire sandblasting machine produces a high-velocity abrasive stream. The unit stands less than 3 ft high, has a tank capacity of 100 lb of abrasive, and is equipped with tungsten carbide tips, guaranteed for 300 hours use. Cost is $139.50 fob Los Angeles.

Sandaire Mfg. Co., 1241 Temple St., Los Angeles, Calif.



SPECIAL MACHINE for drilling, spot-facing, and tapping automotive gear-shift housing consists of three Avey cam-feed units mounted horizontally on a steel base. Operations include 0.5 in. drill, 1.312 spotface and countersink, and 0.562-18 in. tap. Work is held on a four-station 18-in. hand-index table with four hand clamping fixtures. A total of 500 gearshift housings are processed per hr.—*The Avey Drilling Machine Co., P. O. Box 625, Cincinnati 1, Ohio*

Work-Holding Devices Hold Narrow Tolerances

In-R-Tool work-holding device is for use in lathes, vises, boring mills, machine tables and fixtures, and electric drills and drillpresses. It is said to save time on setup and make-ready and holds narrow tolerances in machine shops. This inner-pressure tool is primarily an expanding arbor. Cores and pressure members that fit the splines of the cores are interchangeable. Cores have a range from $1\frac{1}{4}$ to $2\frac{3}{4}$ in. and N.C. $\frac{3}{4}$ - 10 precision threads. The In-R-Tool short-work tool, with a range from $1\frac{1}{2}$ to $2\frac{1}{4}$ in. retails from $29.50. Complete kit with all accessories and range from $1\frac{1}{4}$ to $2\frac{3}{8}$ in. sells for $69.50.

Layne-Held Corp., 2005-B South Shelby St., Higginsville, Mo.

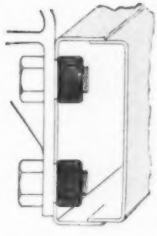
Parts Assembled with MIDLAND WELDING NUTS Stay Put!

The Metal Tears . . . But the Weld HOLDS!

HERE'S PROOF, in this unretouched photo of a part in production, that Midland Welding Nuts assure strength and stability in assemblies of metal stampings. They also speed production and reduce costs.

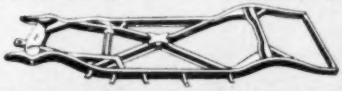
Solve PRODUCTION PROBLEMS CREATED BY HARD-TO-GET-AT PLACES . . . .

In "blind spots" like the one illustrated here, Midland Welding Nuts are particularly useful—eliminating the necessity of one man holding the nut while another turns the bolt into it. You can use Midland Welding Nuts advantageously in the assembly of any combination of metal stampings. May we discuss pertinent production problems with you? Write or phone us today.



The MIDLAND STEEL PRODUCTS CO.

6662 Mt. Elliott Avenue • Detroit 11, Michigan



WORLD'S LARGEST MANUFACTURERS OF AUTOMOBILE FRAMES—

Three good ways to reduce your gage block costs

You can go a long way toward lowering your "break-even" point just by keeping an eye on the many tremendous trifles in your manufacturing costs. Take gage blocks, for example. The price you pay for even the best is insignificant compared to the savings they make possible. Assured sustained accuracy of production! More efficient inspection. Fewer rejects. Yet here are three good ways to cut this basic cost of precision:

1 **Get longer wearing millionths with**
ELLSTROM CHROMIUM PLATED GAGE BLOCKS

They give you 5 to 20 times longer wear than ordinary blocks, yet they cost but very little more. Unconditionally guaranteed to specified millionths. Rated "tops" for all-around gage block quality.

2 **Maintain the accuracy of your basic standards through**
ELLSTROM INSPECTION SERVICE

Rejects can raise cain with costs. So it's false economy to let your gage blocks become worn beyond their specified millionths. Let Ellstrom inspect your gage blocks periodically . . . and replace them as required . . . to assure constant "block-by-block" accuracy.

3 **Save up to 20% on new blocks through the liberal**
ELLSTROM EXCHANGE PLAN

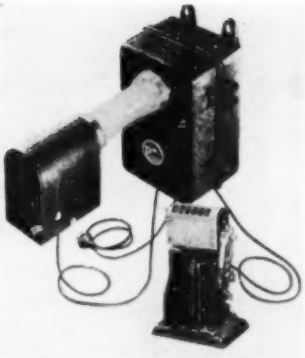
When you need new blocks, don't scrap your old ones. Trade 'em in! They're worth up to 20% on the "W" purchase price of new ones under Ellstrom's Exchange Plan.

New ELLSTROM Catalog of Standards!
Contains complete specifications and prices on standard Ellstrom Gage Block Sets . . . plus full details on Ellstrom's Inspection Service and Exchange Plan. Write for your copy today!

Ellstrom . . . measuring in millionths for 3 generations

DEARBORN GAGE CO.
22035 Beech Street
Dearborn, Michigan

Originators of Chromium Plated Gage Blocks



Photoelectric Counter Includes Control, Light Source, Counter

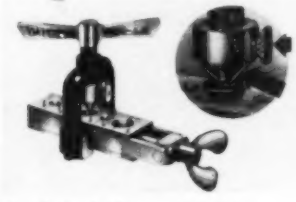
The Photoswitch counter set P-1 can tally up to 600 counts per min and allows 6-ft space between photoelectric units and light source. One or more electric counters may be placed at any convenient location and wired to the control. The unit plugs into 115-volt, 60-cycle ac standard light outlet.

Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass

Cutting-Tool Series Combines High Hardness, Toughness

Subjected to a series of high and low heat treatments in sequence, and containing approximately 13% cobalt, "Lucky-13" cutting tools are said to have hardness of C 66-68 and tensile strength of over 300,000 psi. A cutoff blade of this material 3/16 x 1 x 6 in., will bend 0.308 before breaking. Ground square and flat tool bits and ground cutoff blades are available in a variety of sizes.

Plew Tool & Metal Heat Treat, Columbia City, Ind.



Hand Tool Flares, Burnishes Copper, Brass, Aluminum Tubings

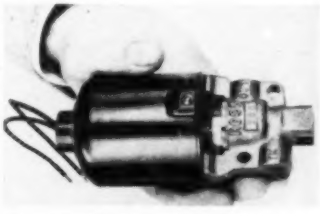
The Rol-Air flaring tool both flares and burnishes copper, brass, and aluminum tubing to make up tighter and stronger flared-tube joints. The tool has three rollers built in the spreader cone. After the tubing is flared, it is burnished by turning the operating handle two more revolutions with the control knob in burnishing position. Heat-treated sliding dies are designed so as not to score the tubing. The Rol-Air flaring tool handles ¼, 5/16, ⅜, ½, and ⅝ OD tubing.

The Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago 7, Ill.

Pressure Handle Helps in Portable-Drilling Operations

Attached to standard portable electric or pneumatic drills, chain pressure handle enables operator to control drilling pressures by simply turning the handle. One end of the feed chain is fastened to the work and the other is placed over the channel sprocket on the handle. Twisting the handle creates a pulling force on the chain.

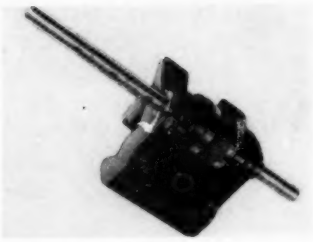
Pressure Handle Co., North State St., Wilkes-Barre, Pa.



Solenoid Air-Control Valve Is Direct-Operated Unit

Quick-operating air-control valve is ⅛-in. pipe size, straightway or three-way with in-line, side, bottom, or panel mountings. It is direct-operated using standard Ross solenoid and can be obtained in both normally opened and normally closed models. Straightway units are suitable for control of liquids as corrosion-resistant materials are used throughout.

Ross Operating Valve Co., 120 E. Golden Gate Ave., Detroit 3, Mich.



Carriage Spacer Fits All Toolroom Lathes

Combined micrometer stop and lathe-carriage spacer is said to save from 3 to 10 min on every job requiring micrometer stops. This spacer is reported to permit faster, more accurate, setting for boring holes to greater depth, and accurately spacing shoulders, grooves, and undercuts on all turning jobs. The micrometer stop fits all makes and sizes of toolroom lathes. It is adjustable by 0.001-in. increments from 0 to 6 in. The price is $14.95 fob Detroit.

Ellwood Products Co., 3049 E. Grand Blvd., Detroit 2, Mich.

Rotary Broach Has Detachable Head

Said to cost substantially less than the reamers they replace, these rotary broaches, in sizes above 15/16 in., are detachable from their special holders. The broach has an internal thread accurately formed by a rotary broach. After hardening, both the internal thread and its mating rotary broach hole are lapped to exact size so that they will fit the special threaded driving holder.

Shearcut Tool Co., Reseda, Calif.

Safco 770 Compound Is All-Purpose Coolant Base

Safco 770 Compound is a water-soluble coolant base with a consistency of liquid paste, said to combine all the essential qualities of a grinding compound and a sulphurized cutting oil. Mixed with water in ratios as high as 80 to 1 it is reported to prevent wheel loading, reduce wheel dressing, keep work from rusting, and keep solutions free of foul odors.

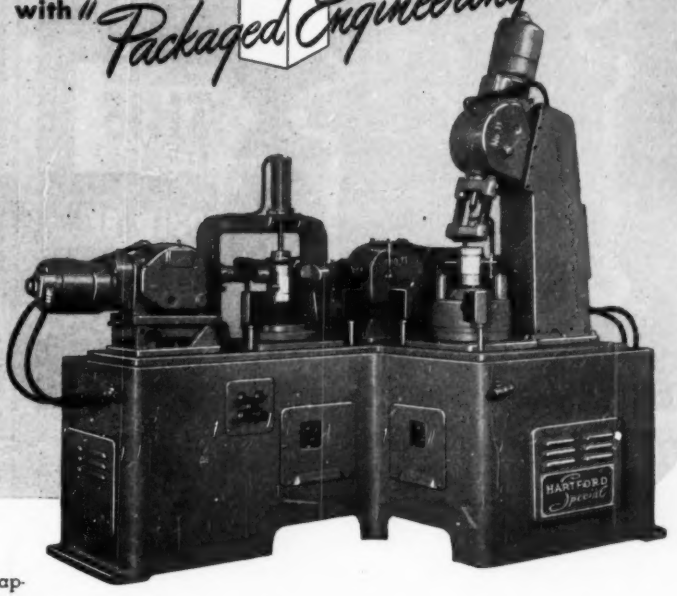
Swan-Finch Oil Corp., RCA Building West, New York 20, N. Y.

Give production a prod

with "Packaged Engineering"

featured in all
Hartford Special
"LANGELIER"

AUTOMATIC DRILLING & TAPPING MACHINES



Hartford Special Drilling and Tapping Machines are built to do a lot of producing in a limited amount of space. All the factors that are considered by Hartford Special Engineers in planning a job have been refined to make every second and every fraction of an inch count, and to leave as little as possible to the skill of the operator. Such timesaving devices as automatic clamping fixtures as well as safety features like twin start-stop buttons all come as a bonus with the "packaged engineering" that Hartford Special has to offer. If you are looking for a special single-purpose machine to put your production out ahead, write our Engineering Department now. The Hartford Special Machinery Company, Hartford 5, Conn.

The horizontal heads of this machine drill 6 sets of opposed holes irregularly spaced, while the angular head drills 12 holes. Pieces are clamped, indexed, drilled and unclamped . . . all automatically.

Automatic Unit
No. 11 & 31

Lead Screw
Tapping Unit
No. 12 & 22

The spindles of all units are of alloy steel, heat treated and ground, mounted in anti-friction bearings. All gears are of heat treated alloy steel. Dovetail adapter plate with screw adjustment permits quick and accurate positioning.

HARTFORD Special
. . . the standard for special machinery

Those who use small, precision gears as component parts of their completed assemblies can profit by the convenience and economy of producing them on the Hamilton No. 1 Precision Gear Hobber.

Built to extra close tolerances, the Hamilton No. 1 is designed also for super-rigidity to provide *lasting* precision under heavy loads. Hobs spur, spiral, and bevel gears, gear sectors, splined shafts, pinions, and worm gears of fine-watch precision and on high production schedules.

Speed, feed and indexing can each be set independently of the others. This feature, plus the wide range of Hob Spindle speeds (109 to 1259 R.P.M.), provides the machine with extra versatility; cuts set-up time far below previously acknowledged minimums and permits easy adjustment of speed and feed to the requirements of material being worked or gear size being hobbed.

The ideal Gear Hobber for use in shops where set-ups are frequent or in shops where runs are long.

For full information write for our new Bulletin H 1-49.

THE Hamilton TOOL COMPANY

SUPER-SENSITIVE DRILLING MACHINES · TAPPING MACHINES · PORTELVATORS

830 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

Steel Stand Increases Versatilty of Spotwelder

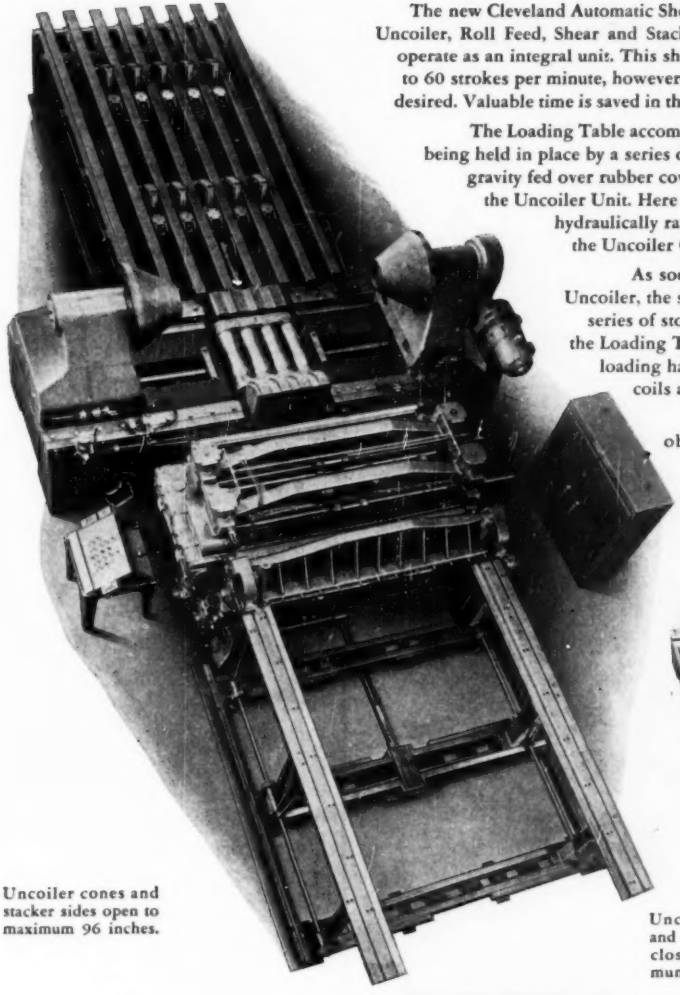
A foot lever on the lightweight-steel stand for this portable self-operating spotwelder frees both the operator's hands to hold the work. The welder is held by two metal brackets and can be easily removed for portable service. The welding tool is available in both 110- and 220-volt ac models, 50-60 cycles. It is said to weld up to ⅛-in. combined thickness of metal including stainless steel and mild steel, as well as two pieces of 18-gage galvanized.

Greyhound A.C. Arc Welder Corp., 606 Johnson Ave., Brooklyn 6, N. Y.

Attachment Adapts Drillpress For Turning, Boring Operations

The Turnbug is an attachment for doing turning and boring work on a drillpress. It is built for precision work and is easily fastened to any drillpress table. The upper end of the work is held in the drillpress chuck, while the lower end rotates on a center located on the Turnbug base. Work up to 4-in. can be turned. For boring, the work is clamped to the tool bar and an adjustable jig-boring tool is fastened in the drill-press chuck. Horizontal and vertical

New CLEVELAND AUTOMATIC SHEAR eliminates costly setup time



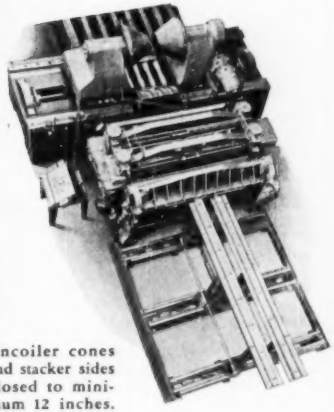
Uncoiler cones and stacker sides open to maximum 96 inches.

The new Cleveland Automatic Shear combines Loading Table, Automatic Uncoiler, Roll Feed, Shear and Stacker. These units are synchronized and operate as an integral unit. This shear is designed to operate at a speed up to 60 strokes per minute, however, this rate varies with length of material desired. Valuable time is saved in the automatic operation of this new shear.

The Loading Table accommodates two 20 ton coils at a time, each being held in place by a series of stops. As the first coil is released it is gravity fed over rubber covered rails until arrested by the stops in the Uncoiler Unit. Here the coil is resting on an elevator and is hydraulically raised until centered opposite the ends of the Uncoiler Cones.

As soon as the first coil is positioned on the Uncoiler, the second coil can be advanced to the next series of stops. Another coil can now be placed on the Loading Table at any convenient time. Automatic loading has eliminated waste time involved when coils are placed directly on the Uncoiler.

Investigate the savings that you can obtain through the operation of this shear. Various sizes and capacities can be furnished to your specifications. Complete information will be forwarded at your request. A-2500



Uncoiler cones and stacker sides closed to minimum 12 inches.

THE CLEVELAND PUNCH & SHEAR WORKS CO. U.S.A.

Established 1880

PUNCHING TOOLS & DIES

FABRICATING TOOLS

POWER PRESSES

OFFICES AT:
NEW YORK.....CHICAGO
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CLEVELAND 14, OHIO

AVOID COSTLY DELAYS AT THE TOOL CRIB

One of a Dozen Ways Savings Can Be Made . . . with McCaskey Control

Tool crib waiting time and overhead on idle machines add thousands of dollars monthly to production costs. It happens in other plants and may be happening in yours today.

"How Tool Costs Were Cut 12 Ways in 20 Plants" reports how manufacturers large and small have eliminated such delays with McCaskey Control. Reports of other big savings are told in the words of responsible plant executives . . . results and how they have been secured. They all add up to substantially lower tool expense and improved operating efficiency.

Let us send you the facts . . . how McCaskey will help cut your tool costs, too. Mail the coupon today for your copy of the booklet.

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INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL

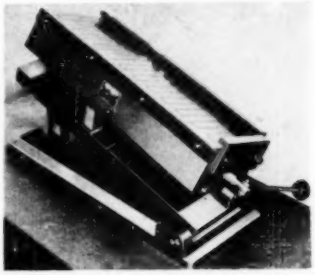
screws regulate the cutting tool relative to the work.

Balfre Gear & Mfg. Co., 4711-17 W. Lake St., Chicago 44, Ill.

Portable 6-in. Polisher Weighs 4½ Lb.

Lightweight portable electric tool is for rubbing and polishing metals, woodwork, linoleum, and similar surfaces. It weighs only 4½ lb and has a free speed of 1300 rpm. It is run by a universal motor operating on 115 volts ac or dc and has a dynamically-balanced armature with insulation baked on for full protection durability. Price is $29.95.

Cummins Portable Tools, Div., Cummins Business Machines, Inc., 4740 Ravenswood Ave., Chicago 40, Ill.



Versatile Magnetic Chuck for Production Surface Grinders

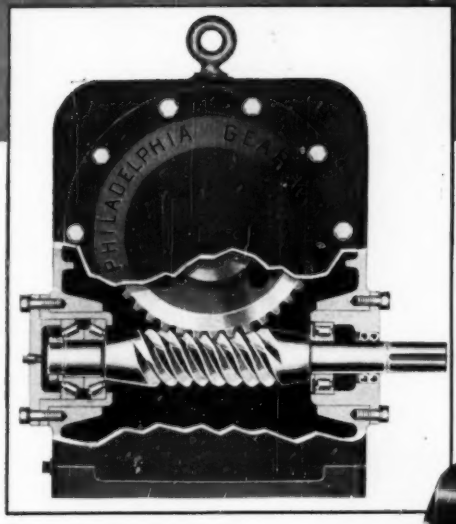
Series 20, for production surface grinders, has a permanent magnetic chuck measuring 7½ x 20½ in, and can be used for either wet or dry grinding. The chuck will handle parallel work, or it can be set up with standard gage blocks for either single- or compound-angle jobs.

Omer E. Robbins Co., 5722 Twelfth St., Detroit 7, Mich.

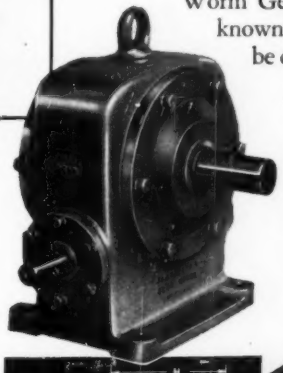
Electronic Cyclo-Timer Has Single Moving Part

The Cyclo-Flex timer may be operated either single interval with manual initiation, or as a repeat-cycle

WHAT MAKES A *Good* WORM GEAR SPEED REDUCER?



Any Speed Reducer is only as good as the *experience* and the *manufacturing facilities* of its manufacturer . . . These factors, plus world-wide acceptance of Philadelphia Worm Gear Reducers, presupposes that these units must be *efficient, rugged and as trouble-free as possible.* In fact, Philadelphia Worm Gear Reducers embody every known mechanical feature that can be considered important for the efficient transmission of power, under all conditions. We offer every type, size and reduction ratio of Worm Gear Speed Reducer.



FEATURES . . .

OF THE TYPE A-T-O AND R-T-O PHILADELPHIA WORM GEAR SPEED REDUCERS

May be had with Worm "above" or "below" the Worm Wheel.

Worms are made of alloy steel with carburized, hardened and tempered threads—both shaft and threads are accurately and smoothly ground after heat-treatment.

Worm Wheels are of highest quality chill cast nickel-bronze.

Bearings are anti-friction types (ball or roller) best suited for smooth, quiet, trouble-free operation (see cut-away illustration).

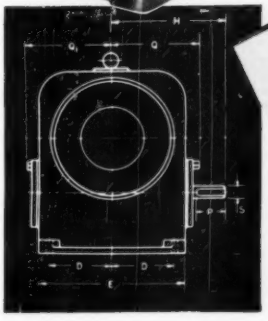
Housings are of "one-piece," quality grey iron—compact, neat, rigid and of ample radiating surface to prevent overheating.

All units carry A.G.M.A. ratings.

Easy accessibility for removal of either Worm or Worm Wheel assemblies, from the one-piece housing.

Lubrication by splash system to all moving parts, in oil-tight housing.

Efficiencies as high as 96%.



Our Catalog No. 26 will give you full details on Worm Gear Speed Reducers. Please write for a copy on your Business Letterhead.

Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK • PITTSBURGH • CHICAGO • HOUSTON

IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

CROSS UNIVERSAL GEAR MACHINES

for

- ROUNDING
- CHAMFERING
- POINTING
- BURRING

Cross Universal Gear Machines embody advanced engineering developments to obtain highest productivity and assure lowest possible operating costs.

They feature utmost flexibility for handling a wide variety of gears. Continuous cutting motion, exclusive with Cross, speeds production at top efficiency.

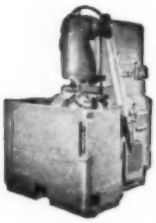
Special skill is not required because machines are automatic and push button controlled. Power clamping is foot pedal controlled. Both hands are free for work handling.

No. 55

For rounding, pointing, chamfering or burring external and internal:

spur gears
helical gears
clutches
splines

Typical productivity when rounding or pointing 8 pitch 30 tooth gears is 55 per hourly.



No. 65

For pointing or chamfering external and internal:

clutches
spur gears
bevel gears
splines

Typical productivity when pointing 10 pitch 30 tooth gears is 100 per hourly.

No. 75

For burring or chamfering both ends at the same time.

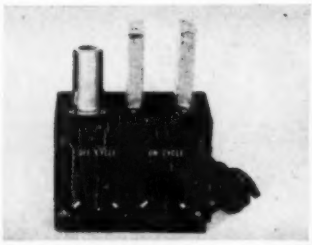
helical gears
spiral bevel pinions
hypoid pinions

Typical productivity when chamfering 8 pitch 40 tooth gears is 200 per hourly.

THE CROSS COMPANY
Established 1898

SPECIAL MACHINE TOOLS
MILLING • DRILLING • TAPPING • BORING
TURNING • SHAPING • GRINDING • HONING

DETROIT 7, MICHIGAN



timer with two adjustable intervals which occur successively without any external operation. To convert from single-interval to repeat-cycle operation requires no change in wiring or additional equipment. The unit employs one vacuum tube, and the only moving part is the electromagnetic relay contactor. Specifications include 110-125-volt, 60-cycle operation.

G. C. Wilson & Co., 2 N. Passaic Ave., Chatham, N. J.

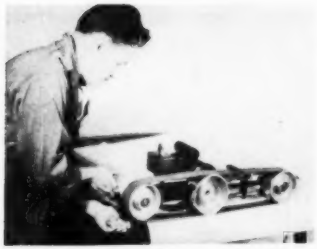
Speed-Reduction Unit Adaptable to ¼-in. Air Drills

Any ¼-in. electric or air drill can be converted into a multi-purpose tool for heavy-duty boring, drilling, reaming, screw driving, or nut running, by attaching the Grip Torc speed-reduction unit to the drill chuck or spindle. Torque output is increased approximately 5 to 1. The body of the unit automatically slips in the hand when work jams, eliminating overloading of the work. Grip Torc is priced at $14.95.

McLaughlin & Co., 909 E. 59th St., Los Angeles 1, Calif.

Grinder Belt Designed For Free-Belt Operation

The Expeditor belt grinder is mounted on an axis that centers at the motor shaft and is so constructed that one turn of a clampnut will set the abrasive belt at any angle. The unit is designed for free-belt operation, form-wheel work or contour grindings, lined contact grinding when much stock is to be removed, or for platen precision grinding, either above or below. Set up at the



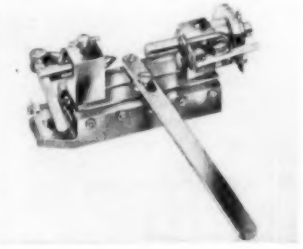
elbow of a milling machine, the Expeditor can deburr, remove cutter marks, or break corners on the spot.

Harvey L. Ramsey & Co., 636 S. 10th Ave., La Grange, Ill.

Illuminator Added to Buhl Pocket Microscope

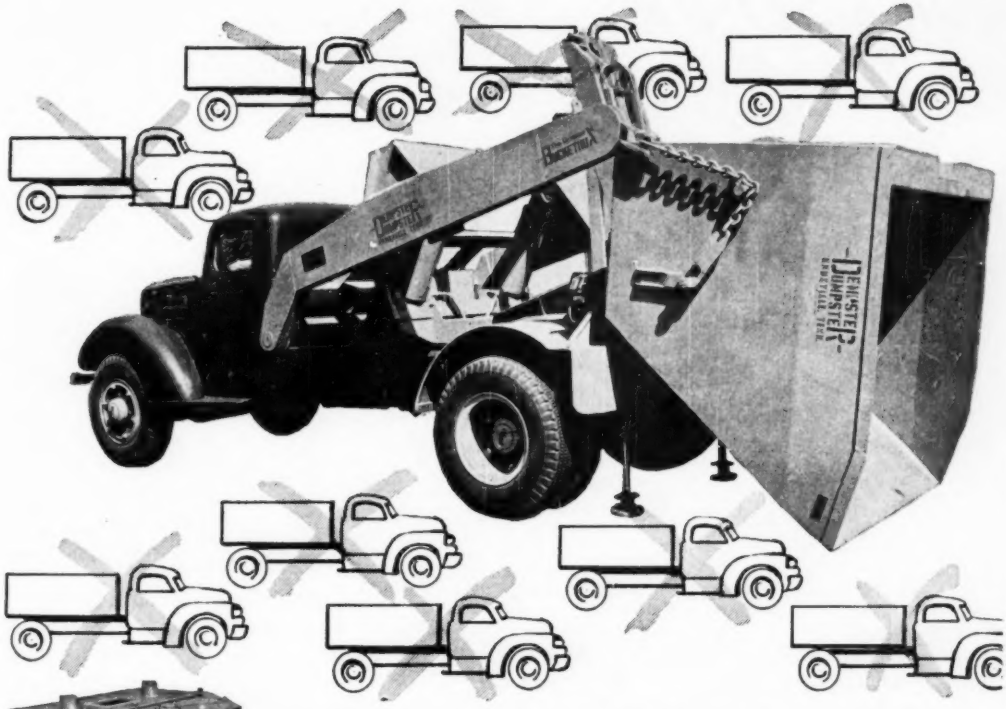
A special illuminator equipped with a standard-size flashlight battery and bulb has been added to the S-129 pocket microscope. The oblique beam of light is said to furnish uniform intensity throughout the observed surface. The light-weight case is turned from aluminum. Illuminator is priced at $5.

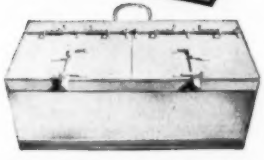
Buhl Optical Co., Desk T-157, 1009 Beech Ave., Pittsburgh 12, Pa.



Collet-Holding Unit Saves Time and Tool Costs

Spline cutting, cross slotting, small-screw slotting, slitting, and a variety of other machining operations can





WOULD YOU WRITE A LETTER FOR FIFTY THOUSAND DOLLARS?

A simple reply to one of our advertisements . . . a meeting of probing minds over the problems involved . . . the replacing of ten conventional trucks with only one Dempster-Dumpster truck unit and 99 containers . . . fifty thousand dollars annual savings for this one firm.

That, briefly, was the result of a simple inquiry for information about the Dempster-Dumpster System of materials handling.

A comprehensive Dempster-Dumpster survey revealed costly delays, unnecessary handling of materials, and much time wasted by loading crews. All were eliminated to the tune of $50,000 savings annually. Fast pick-up, hauling and dumping of pre-loaded Dempster-Dumpster containers replaced the old method of plant hauling. Ninety-nine detachable containers, built in over 20 sizes and designs for the specific materials they handle, were spotted at material accumulation points. Some are handled by fork trucks, others by overhead cranes within plant buildings. As containers are filled, the Dempster-Dumpster truck hoisting unit and one man, the driver, picks up each container, hauls it to its destination, dumps it and returns the empty container for refilling.

Pick-up and dumping of these detachable containers takes less than 60 seconds. The entire operation works to an on-the-run schedule. One truck hoisting unit handling 99 containers and doing the work formerly requiring ten conventional trucks. Let us bring you the complete details of the Dempster-Dumpster System.

Containers, in standard and special types, in capacities from 1½ to 10 cu. yds. are available. Whatever your materials are, be they heavy, light, bulky, dust, liquid, waste, raw or finished, you'll find a Dempster-Dumpster container ready, or custom built, to do the job more efficiently.

DEMPSTER DUMPSTER
TRADE MARK REG.
SYSTEM

DEMPSTER BROTHERS, INC., 4129 DEMPSTER BUILDING, KNOXVILLE 17, TENNESSEE

QUICK SET-UPS....

. . . another BIG advantage with YANKEE TWIST DRILL GRINDERS

With the YANKEE, it doesn't take a skilled operator to make set-ups smoothly, easily and quickly.

Whether drills are large or small . . . long or short . . . straight or taper shank . . . you can change easily from one to another almost without interruption. On the YANKEE, the drill rests in a "V" and regardless of size, always centers itself.

The YANKEE Twist Drill Grinder grinds quickly and accurately . . . uniform pressure control prevents burning. Adaptable also for 3 and 4 lip drills. Drills are ground with lips of equal length producing accurately sized holes. Yes . . . YANKEE-ground drills cut faster, drill straighter, and stay sharp longer. Before you buy . . . investigate the YANKEE!

Send us some of your drills. We will recondition and return them without cost to you. You'll see a real improvement in their performance when you use them.

Write for free illustrated Bulletin A-129.

COVEL MFG. COMPANY
BENTON HARBOR MICHIGAN

Our 75th Year

Threadwell Tools do many jobs

try them on your tough ones

Drilling problems are no laughing matter

Improper lip clearance is at the bottom of many drilling problems. Too much clearance often leads to the breakdown of cutting edges, while too little clearance impairs the cutting effectiveness of the drill and throws serious strain on the machine. Lip clearance is seldom a problem with Threadwell Twist Drills, because from start to finish rigid control is maintained to guarantee uniformity of every Threadwell Drill. Even the finest steel which goes into Threadwell Twist Drills is kept under constant testing and analysis to ensure that *every* Threadwell Twist Drill is as accurate and long lived as modern manufacture can make it, and that it produces the quality that is a Threadwell hallmark.

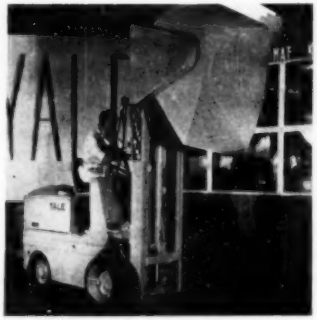
Threadwell

See your local supplier, or write for Bulletin 435R

THREADWELL TAP & DIE COMPANY, Greenfield, Massachusetts
Taps • Dies • Drills • Counterbores • Reamer Blanks • Screwplates • Gages • Pipe Threaders

be handled on smaller machines by use of the Rouse No. 9 collet-holding unit. It consists of a right-hand collet-holder with a blank, circular, indexing plate. Indexing blanks can be milled in individual toolrooms or at the Rouse factory. An adjustable center unit holds larger working pieces. The collet-holder can be used as a jig on machine tools.

H. B. Rouse & Co., Chicago 1½, Ill.



Hydraulically Operated Scoop Mounted on Fork-Lift Truck

Manufactured in sizes ranging from 12- to 27-cu ft capacities, hydraulically operated scoops can be quickly mounted on standard fork-lift trucks. Maximum lift before dumping load is 130 in. The unit shown is mounted on the Lift King gas-powered truck.

The Yale & Towne Mfg. Co., Chrysler Bldg., New York 17, N. Y.

Combustion safeguard, Flame-otrol, for industrial or commercial heating equipment, detects the presence or absence of a gas or oil flame of any type of burner instantaneously. A simple electronic circuit provides instantaneous switching action.—*The Wheelco Instrument Co., 847 W. Harrison St., Chicago, Ill.*

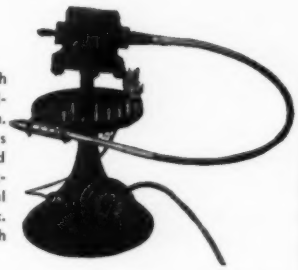
Telfon Tetrafluoroethylene resin produced as a suspensoid, provides tough spray finishes, enamels for insulating fine electric wire, compounds for extruding heavier insulation onto wire, and unsupported films, and tapes.—*E. I. du Pont de Nemours & Co. Inc., Wilmington 98, Del.*

Tramrail bridge crane is a floating suspension design and employs swiveling-end trucks and flexibly suspended runways to eliminate the possibility of binding. Maximum headroom advantages are obtained through use of underslung single-girder bridge construction.—*Forker Corp., Cleveland 6, Ohio*

HERE'S HELP FROM haskins

IMPROVE PRODUCT QUALITY, CUT PRODUCTION COSTS!

Yes, here's real help from the leading manufacturer of flexible shaft equipment . . . HASKINS! It's *help* in the form of versatile tools that assure high quality work, stand up under hard, continuous service, and free labor for more productive work. Haskins Flexible Shaft Machines speedily and efficiently perform grinding, sanding, filing, wire brushing, buffing and polishing for die, mold, and patternmaking, stainless steel and general fabricating. And remember, with flexible shaft tools, the operator handles only the lightweight handpiece—the heavy motor is conveniently located 6 feet away. Operator works faster, with less fatigue. Haskins makes a *complete line*—from lightweight, direct-drive machines, to heavy-duty, multi-speed units . . . all designed to help you speed production and lower costs.



HASKINS VB-2 high speed grinder develops up to 18,000 r.p.m. free speed . . . makes cutting wheels and tools last longer. Recommended for general light production work. Suspended or bench mounted.

HASKINS HS-4 is a pedestal mounted, portable machine recommended for general die shop work . . . has a ½ h.p. air jacket motor, and six-speed, Timken-bearing countershaft that develops up to 7800 r.p.m.

HASKINS RA-5 is recommended for lacquer polishing, rubbing and sanding operations where a portable unit is desired. Heavy-duty ½ h.p. motor, direct drive with speeds to 3425 r.p.m.—pedestal mounted.

HASKINS SPH-6 for stainless steel grinding, sanding, buffing, etc. Has a 1 h.p. motor; four-speed Timken bearing countershaft; speeds to 3400 r.p.m. Mounted on pedestal at bench height.

HASKINS HS-7 is mounted on a three-wheel, heavy-duty truck. Full 1 h.p. motor, four-speed countershaft develops up to 3100 r.p.m. Here's portable equipment recommended for heavy grinding, sanding, wire brushing and polishing operations.

HASKINS haskins

FLEXIBLE SHAFT EQUIPMENT

R. G. HASKINS CO.
2643 West Harrison St.
Chicago 12, Illinois

Please send me complete information on the following:

☐ HASKINS VB-2 ☐ HASKINS HS-4 ☐ HASKINS RA-5
☐ HASKINS SPH-6 ☐ HASKINS HS-7

Name .....
Firm Name .....
Address .....
City ..... Zone ..... State .....

Are Lees Bradner Rotaries expensive to buy . . to own?

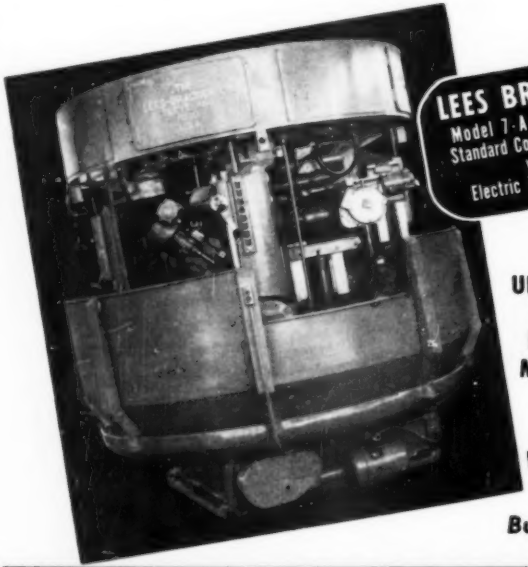
No! Because for example:

Lees Bradner rotary hob spindle bearings *don't require replacing*—the 7A's taper hand scraped hard bronze spindle bearings are fully adjustable to take up for wear when necessary.

Lees Bradner rotary work spindle bearings *don't require replacing*—the 7A's tapered hard bronze hand scraped work spindle bearings too are fully adjustable.

Clutches on the Lees Bradner *never need adjustment*—they are eliminated by the 7A's individual motor drive to each spindle.

When it is time to change hobs on the Lees Bradner, only the unit needing changing stops—not the entire machine—for on the Lees Bradner rotary each unit's operation is *completely independent* of its neighbors—and equally important—of table rotation.



HOW UP-TO-DATE IS YOUR HOBBING MACHINE?

Write today for Bulletin A-59

The LEES-BRADNER Company
CLEVELAND 11, OHIO, U.S.A.

Cerrocast, a non-eutectic alloy of bismuth and tin, has a melting range of 281-339 F, yield temperature 302 F, brinell hardness 22, and shrinkage of 0.0001 in. per in. It is said to be especially suitable for precision casting.—*Cerro de Pasco Copper Corp., New York City, N. Y.*

The Alden Cap-Captive Screw can be turned with an ordinary coin when no tools are available, but will also accept a standard Allen wrench or screwdriver. These fasteners will be supplied with shoulder-type screws, straight shanks, or recess shanks. This cap-screw can be made captive by use of a special retainer ring.—*Alden Products Co., 117 N. Main St., Brockton 64, Mass.*

Chemclean No. 133 is a di-phase cleaner for pre-cleaning all metals. It removes buffing and drawing compounds, oils, and greases without attack, and is safe to work with. To make up the bath pour one volume of di-phase No. 133 in three volumes of water, and the tank is ready for work. After 2 to 5 min in the solution, parts are removed without rinsing and put through either mild alkali soak cleaner or directly into an electric cleaner.—*Chemclean Products Corp., 64 Sixth Ave., New York, N. Y.*

Industrial protective hand cream protects skin against paints, printing ink, lacquers, grease, grime, and oil. Glov-Cote contains no harmful wax fillers and is said to provide skin protection for several hours. It can be washed off with cold water.—*Chase Chemical Co., Cleveland, Ohio*

Thermosetting resin compound, adhesive A-1, joins metals, glass, ceramics, plastics, wood, and other rigid materials to themselves and to each other. Strength value tests are reported, in cases, to have shown the adhesive to be stronger than materials bonded. At room temperature the glue will develop about half its full adhesive strength over night. However, rapid cures may be made an hour or two at 200 F.—*Armstrong Products Co., 391 N. Broadway, Burket, Ind.*

Stock stops, with carboloy face and shanks, are hardened to avoid nicking or scratching by the clamping mechanism. They can be inserted into the turret and are thus not limited as to distance. Diameters are $\frac{5}{8}$, $\frac{3}{4}$, and 1 in., and each size is furnished in two lengths. Stock stops are primarily for Brown & Sharpe machines but can be used in any machine where a stock stop is indicated.—*Balas Collet Mfg. Co., Dept. AM, 1557 E. 27th St., Cleveland 14, Ohio*

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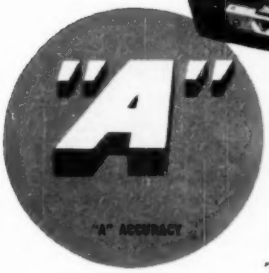

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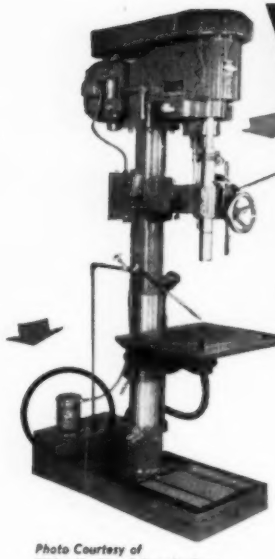

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Photo Courtesy of Sibley Machine & Foundry Corp.

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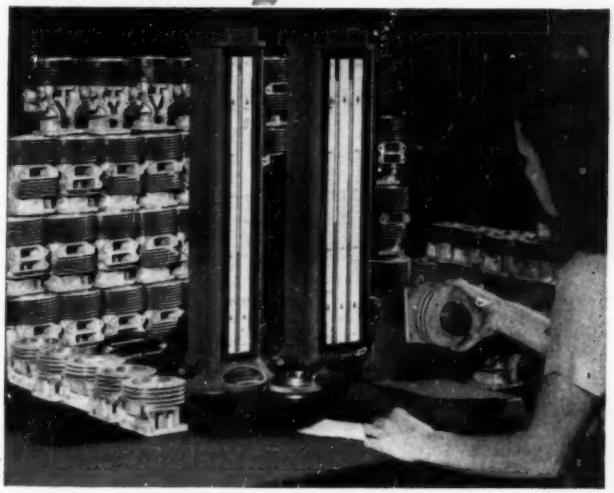

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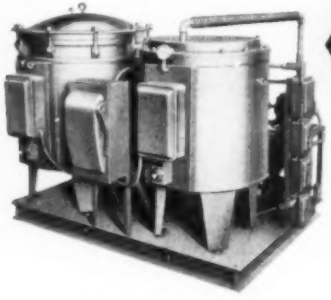

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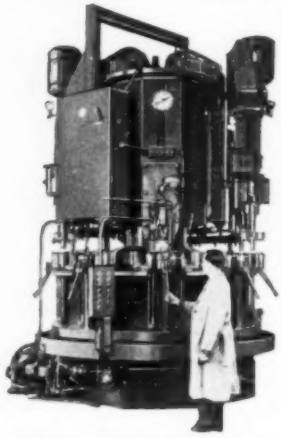

This type VSI vertical indexing drilling machine is designed for drilling, reaming and chamfering five bolt holes and drilling and chamfering one 18" hole in automotive rear axle.

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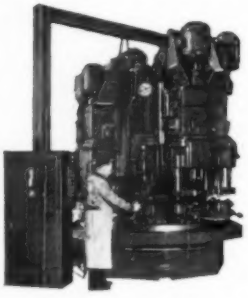

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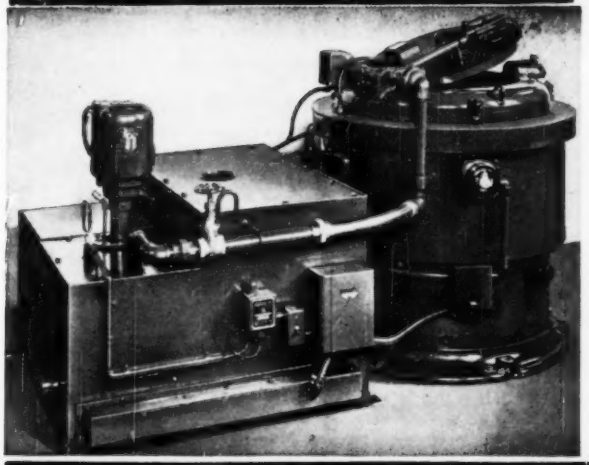

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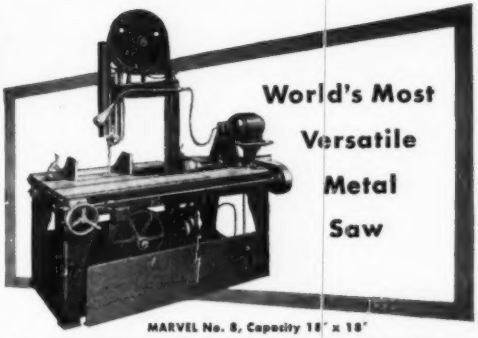

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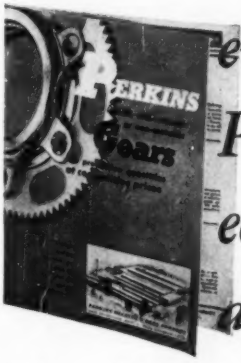

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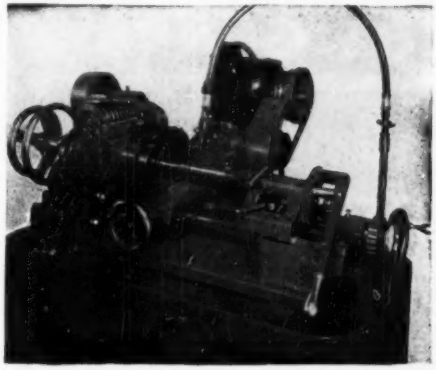

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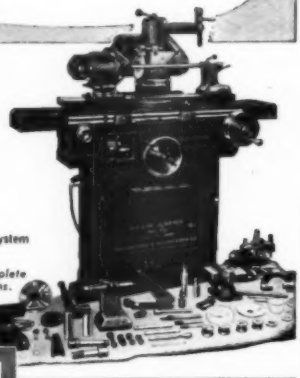

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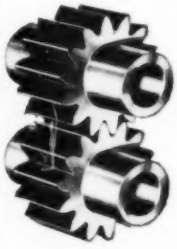

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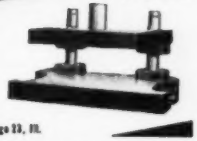

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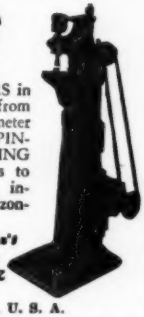

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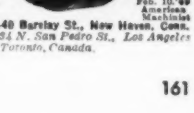

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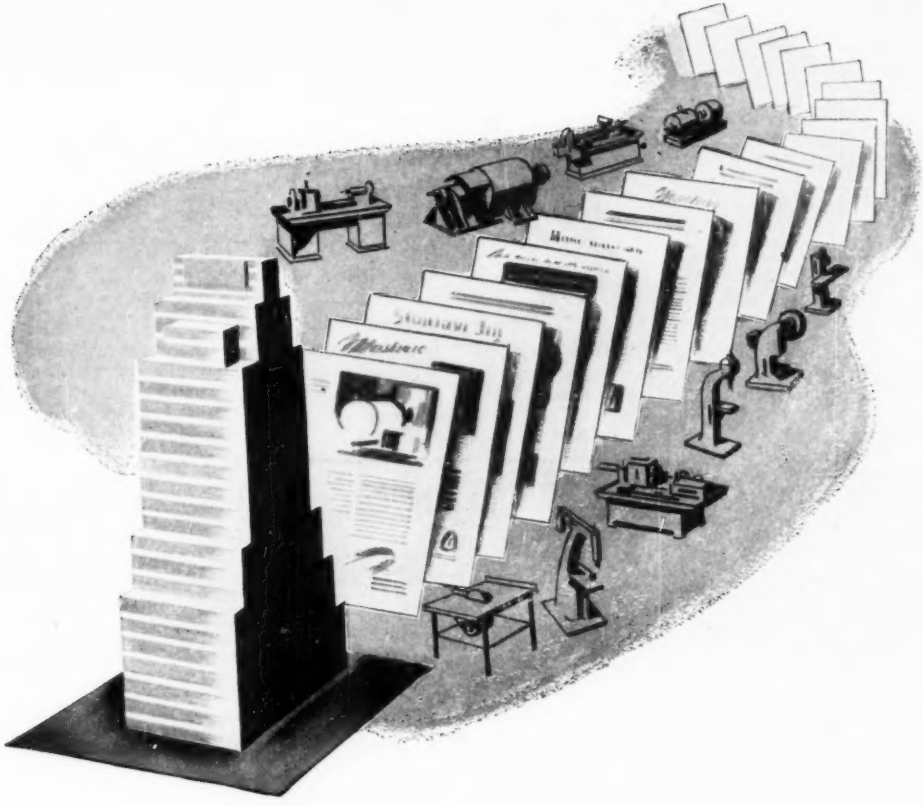

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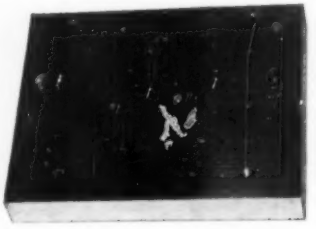

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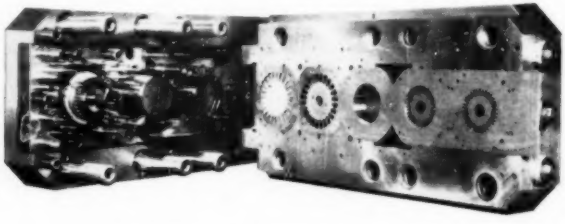
Output from this blanking die and punch seemed O.K. Yet the toolmaker, not content with only "passable" performance, re-examined the tool steel used. With the Carpenter Matched Set Method as a guide, he was able to put his finger on the one steel best suited for the job. Now, with No. 610 (Air-Wear), output has increased over 200%—and the die runs *4 times* longer between grinds. What a return—simply because he wasn't satisfied with "good enough"!



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AUCTION AD ON PAGE 166

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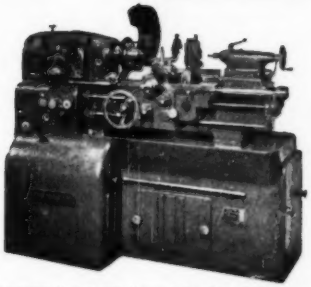


10"x20" Model #EE Monarch Precision Toolmakers Lathe. Late Type. W/Taper Attach. Collets, chucks, toolholders, tool cabinet.

ENGINE LATHES

LeBlond 36"x30' Q.C.G. Hvy. Duty Geared Head Screw Cutting Engine Lathe. Serial #NK-230. 12 Speed Head. 36" internal grd. faceplate, Taper Attachment, Dial Thrdg. Set of toolholders. Max. Swing—39". Centers—22'6". 25 h.p.
24"x6' American Q.C.G. Motorized Cone Head. 11' centers. Taper Attachment 24" chuck, faceplates, cabinet type legs. 220/440 volts motor.
18"x6' Monarch 8-Speed hd. Q.C.G. 220 volts motor. Actual swing—20¼", 20" c.c. Hex. Turret on crosslide. Cabinet legs.
16"x6' Monarch 8-Speed Hd. Q.C.G. 220 volts motor. 24" c.c. Univ. Chuck, Draw-bar & set of 16th collets and 32nd collets.
14½"x6' South Bend Enclosed Head, Motor Driven. Taper Attachment, Chucks, Turret Toolpost Threading Dial, Ram Type Turret Attachment, Collets & Collet Chuck.
14"x8' Reed-Prentice Eight Speed Selective Geared Head, Q.C.G. Motor driven w/220/440 volts motor & controls. Has Taper Att. chuck, faceplates, steady rest, cabinet legs, max. centers —48". Completely rebuilt. Immediate shipment.
22"-46" x 10' Q.C.G. Putnam Extension Bed Gap Lathe. Motor, faceplates & chuck.

PAPER SHREDDERS—NEW
Mitts & Merrill #10,600# per hour.
Mitts & Merrill #14,1800# per hour.
Excellent Condition, Immediate Shipment.

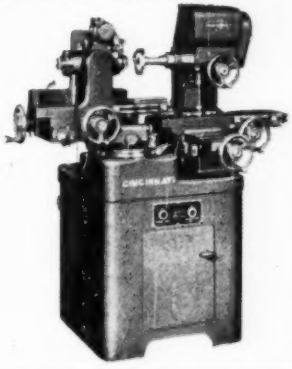
TURRET LATHES

Bardons & Oliver #1 Electric Turret Lathe. ¾" cap. Has bar feed & collets.
Morey #2 Geared Head 1" Cap., M. Dr.
Simmons Microspeed 1" Cap., M. Dr.
W-Swasey #4 Univ. 1½" cap., M. Dr.
Jones & Lamson #3 Univ. Bar Feed 1½".
W-Swasey #3 Univ. 1½" cap., M. Dr.
Bardons & Oliver #7, Univ. 2½" Cap.
W-Swasey #3A Univ. 3½" cap., M. Dr.
Warner & Swasey #1A Universal Heavy Duty Saddle Type Turret Lathe. Serial #648220. Capacity —2½" rd., Gr. Hd. 12 speeds. Coolant system, bar feed, chuck & tooling. Immediate delivery.

GRINDING MACHINES

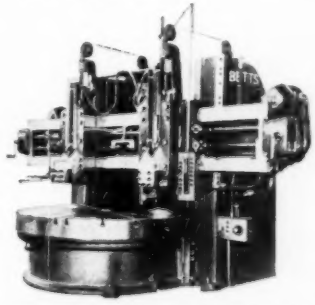
Blanchard #16 Motor Driven Vertical Rotary Surface Grinder. 26" Chuck with power down feed.
Cincinnati 10"x36" Plain Hydraulic Cylindrical Model #EA. Serial #5P2D1L-19. Filmatic Bearings. Built-in Electrics. Hydraulic Infeed.
#2 Cincinnati Universal Tool & Cutter Grinder. Late Type. Univer. Motor Driven Workhead.

Cincinnati 'Monoset' Model #OE Cutter & Tool Grinder. Late Type. With Taper & Cylindrical Collets, motors & Equipment. New-1942.

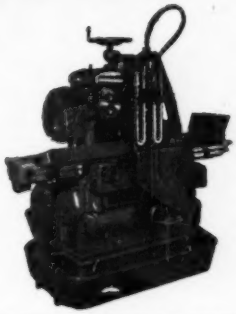


PUNCH PRESSES

O.B.I. Toledo #5, 44 tons cap. motor dr.
O.B.I. Bliss #18, 19C, 20, 20B, 21 motorized.
O.B.I. Michigan, 36 tons cap. Wide ram & bed.
#68C Bliss Dble. Action 3-Crank.
#91C Toledo Sgle. Act. Dble. Crank S.S.
#305 Bliss S.S.S.A. 95 Tons Cap.
#3A Bliss S.A.S.S. Dble. Crank. 42 Tons.
Zeh & Hahneman 35 Tons S.A. Cam Release Spring Return. 220/440 motor.



Betts 100" Vertical Boring & Turning Mill. 1944 machine. 2 plain heads. Complete Electrical Equipment. Excellent condition.



Brown & Sharpe #12 (Electrics built-in) Late Type Milling Machine. 24" Table Travel. Motor driven coolant. Also 18" travel machines.

MILLING MACHINES

Milwaukee #2B Dble. Overarm, Horiz.
#3 Dial Type, H.S. Cincinnati Vertical Mill. Power Rapid Traverse, speeds up to 1300 r.p.m. Range—34"x16"x16" Head has 6" vertical with four stop indicator. Serial #4A3V1L-61.
#2SP Van Norman Late Type Horiz.
#3V Van Norman Ram Type Vert. Late Type.
#2, #3, #4 Cincinnati High Power Vert.
#4-36 Cincinnati 4-Spdle. Duplex Hydromatic.
#4-36 Cincinnati Plain Hydromatic.

UNIVERSAL MILLING MACHINES

B & S #2, 20"x5"x17½".
B & S #1½, 20"x7"x18".
Bridgeport, 20'x9'x16" Turret Type.
Garvin #2MU, 24"x8"x18".
Kempsmith #2, 28"x8½"x18".
Cincinnati #2M, 28"x10"x18".
B & S #3, 34"x10"x21".
Cincinnati #3S 34"x12"x20".

NEW—GEMCO 20" Universal Shaper. 220/440 motor. Power Rapid Traverse, horiz. & vert. Large Discount. Immediate shipment.

RADIAL DRILLS

Cinci-Bickford 6' Arm, 15" Col. Speeds.
Cinci-Bickford 5' Arm, 13" Col. 24 Speeds.
Cinci-Bickford 3' Arm, 9" Col. 12 Speeds.
Cinci-Bickford 6'-19" Super Service. New in '42. 36 Spdle. Speeds. Standard Base, plus angle base. Necessary Motors.

BORING MILLS

3½" bar Giddings & L. Horiz.
5" bar Barrett #2 Cylinder.
8" bar Barrett #6 Cylinder.
Ryerson #11 Horiz. 3" Capacity, #6 M.T.
24" Bullard Vertical, Motorized.
42" Bullard Vertical, Motorized.
54" Bullard Vertical, Motorized.
42" Gisholt Vertical, Motorized.

NEW 80 PAGE CATALOG MAILED FREE UPON REQUEST

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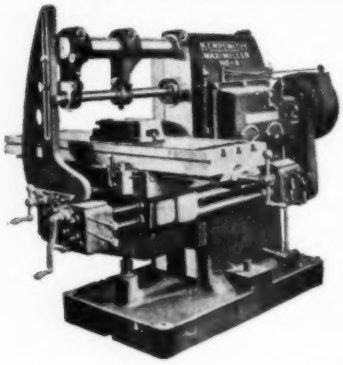

No. 3 Kempsmith "MAXIMILLER" Plain, with motor in base. Power rapid traverse. Table work surface 14"x58". Longitudinal feed 34", transverse feed 12", vertical 19". Eighteen spindle speeds, range 16 to 400 RPM. Eighteen feeds, range IPM .625" to 25". Overarm diameter 6". Pump, piping, arbor supports and brace. Inspect at Albany.

No. 5 Kempsmith "MAXIMILLER" Plain, with motor in base. Power rapid traverse. Table work surface 18" x 84". Longitudinal feed 52", transverse feed 16", vertical 19". Spindle nose No. 50 American Standard. Eighteen spindle speeds, range 14 to 355 RPM. Eighteen feeds, range IPM 5/8" to 25". Overarm diameter 8". Pump, piping, arbor supports and brace. Inspect at Albany.

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Gess & DeLeeuw 6x6½" 5-Spindle
Gess & DeLeeuw 8" 5-Spindle
Gess & DeLeeuw 7½" 6-Spindle

DRILLS & RADIALS

Allen 6-Spindle Drill Press
Avey S. S. #3 Drill Press
Edlund 4-Spindle Drill Press
Edlund 6-Sp. Drill Presses
Foote-Burt #2 S. S. Drill Press
Natco 4 AL 16-Sp. Drilling Machine

LATHES

American 20 x 72" Engine Lathe
Bradford 16x54" Lathe
Hendey 14" Engine Lathe
Gisholt #5 Turret Lathe
Jones & Lamson #3 Turret Lathe
LeBlond 21 x 7' Engine Lathe
Lodge & Shipley #3A Duomatic Lathe
Monarch 20 x 72" Centers Engine Lathe
Reid #6 Small Piece Production Lathe
Reed-Prentice 14 x 54 Lathe 8' Bed
Reed-Prentice 14x30 Lathe 6' Bed
New Haven 84" x 24' Lathe
Wickes 36 x 16' Bed Engine Lathe

SHAPERS

Fellows #6 & #61 Gear Shapers
Morey 14" Vertical Shaper
Rockford 25" Hy-Draulic Shaper
Smith & Mills 16" Shaper

MILLS

Cincinnati 2-18 Production Mill
Cincinnati 2-24 Mill
Cincinnati 3-24 Hydromatic Mill
Cincinnati #3 Plain Mill
Hardinge Vert. & Horiz. Mills
Kearney & Trecker #2 Plain Mills
Kearney & Trecker #3K Horiz. Mill
Lees-Bradner 12x36 Thread Mill
Morey #12-M Vertical Profiler and Milling Machines
Producto Hand Mill—Model M

BORING MILLS

Bullard 36" Vertical Boring Mill
Bullard 62" Vertical Boring Mill
Cincinnati 44" Vertical Boring Mill
Lucas #31 Horizontal Boring Mill
Niles 100" Vertical Boring Mill
Rogers 36" Vertical Boring Mill

PRESSES

Bliss #30-3½ S. S. 35 Ton Punch Press
Bliss #58 Punch Press 10 Ton
Ferracute 100 Ton S. S. Punch Press
HPM 150 Ton Hydraulic Press
Toledo #8-56 Punch Press 135 Ton
V & O #3 Inclinable Punch Press

MISCELLANEOUS

Douglas Slotter
Fosdick #30-A Jig Borer
Foster Superfinisher 4" x 8"
Niles 90" Quartering Machine

GRINDERS

Arter A1—12 Surface Grinder
Arter A3—16 Rotary Surf. Grinder
Brown & Sharpe #3 & #2 Univ. Grinders
Brown & Sharpe #3 Cylindrical
Brown & Sharpe #22, 10x36 Cyl. Gr.
Bryant #5 Chucking Grinder
Cincinnati 6x18 Cylindrical Gr.
Cincinnati Monoset Cutter Gr.
Cincinnati #2 T & C Grinder
Covel #15 Surface Grinder
Ex-Cell-O #31 Plain Thread Gr.
Hammond #3 Gr., Buffing & Polisher
Hammond Model #12 D.E. Grinder
Hanchett #36 40" Rotary Surf. Gr.
Heald #22-12" Rotary Surf. Grinders
Heald #72 Internal Grinders
Heald #72A-3 Plain Internal Grinder
Heald #81 Gagematic Internal Grinder
Heald #81 Sizematic Internal Grinders
Hill-Acme 10x60 Surface Grinder
Hisey-Wolf 4F Stand Grinder
Jones Lamson 6" x 30" Thread Grinder
Landis 6x36, Type "C" Plain Grinder
Landis 10x18 Grinder
Thompson 6x18 Surface Grinder
Rivette #104 Internal Grinder

ACME-GRIDLEY 3½" RA-6 SPINDLE (late type)

NORTON 16x36" TYPE "C" PLAIN CYL. GR. late type)

FOSDICK 4'11" RADIAL DRILL (late type)

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CINCINNATI GILBERT 3½" bar, floor type, latest
DETRICK & HARVEY 4" bar, Floor Type, M.D.
GIDDINGS & LEWIS #287, 2½" bar, Latest Type
GIDDINGS & LEWIS single end, Borematic, Latest
HEALD 48, 49 single end, M.D.
LANDIS—2½"-3½" bar, floor type, M.D.
LUCAS #41, 3" bar, Table Type, Late Type
LUCAS #43, 5" bar, Table Type, Floor Type, M.D.
NILES-BEMENT-POND 5", 8" bar, Floor Type, M.D.
UNIVERSAL 3" bar, high speed, latest type

BORING MILLS—Vertical
BULLARD 16" 6-spindle Mult-Au-Matic Type D, Latest
BULLARD 14" 6-spindle Mult-Au-Matic Type D, Latest
BULLARD 24", 36" Turret "New Era" Side Head, M.D.
BULLARD 24", 36", 42" Vert. Turret "Spiral Drive"
High Speed, Latest Type
COLBURN 72", 2 swivel heads, PRT, M.D.
KING 62", 2 swivel heads, Rapid Traverse, AC M.D.
NILES 100", 2 swivel heads, Rapid Traverse, AC M.D.

BROACHES
AMERICAN V-2, 6 ton Hyd., Latest Type
CINCINNATI 1-30, 3-30, Duplex Vertical Surface, Hyd., Double Ram, Model EB, Latest Type
LaPOINTE 3-36 Vertical, Hyd., Latest Type

DRILLS—Miscellaneous
BARNES H-3 "Hydram," Hydraulic, 3" capacity—for inverted drilling, Latest Type
CINCINNATI RICKFORD 24" Box Column, Latest
CINCINNATI RICKFORD #1LMS, 4 Spindle, Latest Type
LELAND & GIFFORD #2MS, Single Spdle.
LELAND & GIFFORD —2, #2MS, 3 and 6 spindle, Latest
LELAND & GIFFORD #2LMS 3 and 6 spindle, Latest
NATCO #4AL Multiple, 30 spindles, Hyd., Latest Type

DRILLS—Deep Hole
BARNES 420/2 Spindle Hydraulic, Latest Type
LeBLOND #2 Single Spindle, Hydraulic, Latest Type
PRATT & WHITNEY #1Bx50", Hyd., Latest Type

DRILLS—Radial
AMERICAN 4' arm 11" col. "Hole Wizard," Latest
AMERICAN 4' plain Triple Purpose, Motor Drive
AMERICAN 5' arm 13" column Plain, M.D.
CINCINNATI RICKFORD 5'/13" Column, Plain, M.D.
CIN. RICKFORD 6' arm 13 col. Plain & Univ., M.D.
DRESES 5' arm 13" column Univ., M.D.
WESTERN 6' arm 20" column Plain, Latest Type

GEAR CUTTING EQUIPMENT
BARBER COLMAN #12 Hobber, Single and Double Worm, Latest Type
BROWN & SHARPE 6-60 Gear Cutter, Motor Drive
BROWN & SHARPE #13 Spur and Bevel Cutter, M.D.
CROSS #1 Tooth Rounder, Motor Drive
CROSS #50 Universal Gear Chamferer, Latest Type
FELLOWS 6, 6A, 6SA, 6Z2, Model Z, 7A, 7, 72, 72S, 77 High Speed Gear Shaper, Latest Type
FELLOWS 6, 6LA, 6SA, 6Z2, Model Z, 7A, 7, 72, 72S, 77 High Speed Gear Shaper, Latest Type
FELLOWS #13M Involute Measuring Instrument, latest
FELLOWS #13LS Lapper, latest type
FELLOWS #3 Bed Liner, Latest Type
FELLOWS #4 Hypoid Spiral Generator, latest type
GLEASON #14 straight bevel generator, latest type
GLEASON 9", 12" straight bevel Tester
GLEASON #, #5-18 Bevel and Hypoid Tester
GLEASON 24", 27", 96" Straight and Bevel Gear Planer, Motor drive
GOULD & EBERHARDT 12H Hobber, Latest Type
GOULD & EBERHARDT 06H Hobber, with diff., M.D.
GOULD & EBERHARDT 10" Grinder, hyd., latest
PRATT & WHITNEY 10" Grinder, hyd., latest

GRINDERS—Cyl.—Plain & Univ.
BROWN & SHARPE #1, 2, 3, 4, Universal, Latest
BROWN & SHARPE #5 Plain, 3 x 12, Latest Type
BROWN & SHARPE #5 Plain Hyd., Latest Type
LANDIS 4x12, Type H, Plain Hyd., Latest Type
LANDIS 6"x18" Type F, Plain, Hyd., Latest Type C.
NORTON 6"x18", 6"x30", 14"x36", 10"x72" Type C. Plain, Latest Type

GRINDERS—Miscellaneous
BARBER COLMAN #2, #4 Hob Sharpener, Latest
BROWN & SHARPE No. 13 Univ. Cutter & Tool, Lat.
BRYAN 8-16-CP-16, #24—30", Internal, Hyd., Latest
CINCINNATI #2, #4, Centerless "Filmatic", Latest
CINCINNATI "Monoset" Tool & Cutter, Latest
GARLOCK 24-53" Disc Grinder, Latest
FITCHBURG 14"x20" Spline, hydraulic, latest
GLEASON #12 tool sharpener, Latest Type
HEALD 72A2, 72A3 "Gagematic," Internal, Latest
HEALD 72A5, 72A6, 72A7, 74, 74A Internal, latest
HEALD #81 Internal Centerless, Latest Type
JONES & LAMSON 6x15, 8x48 Auto Thread, latest
LANDIS #6, 6x24 Thread, latest type
LANDIS #12 Centerless, Hydraulic, Latest Type
THOMPSON 5"x18" Auto., round broach, M.D.
VAN NORMAN #672, #620, #639, #73 Oscillating Radius Grinder, Latest Type
VAN NORMAN #666 Crankshaft Regrinder, Latest

GRINDERS—Surface
BLANCHARD #11, 16" dia. mag. chuck, Latest
DO-ALL Model G-1, 9"x20" Hyd., Latest Type
BLANCHARD 16A Vertical, Dial Feed, Motor Drive
BLANCHARD Series 300 12"x48" Vert. Hyd., Latest
HANCHETT Series 300 12"x48" Vert. Hyd., Latest
HANCHETT #36 Vert., 36" dia. mag. chuck, Latest
HANCHETT #120, 30x120" Plano, Hyd., Horiz., Latest
HANCHETT #120, 30" dia. mag. chuck, Latest type
HEALD #22 Rotary, 12" chuck, latest type, Hyd.,
HEALD 25A—rotary—16" and 30" chuck, Hyd., Latest
NORTON 6x18 Hydraulic, latest type
THOMPSON 12x12x24 Type D Hyd., Latest Type

JIG BORERS
KEARNEY & TRECKER Model B, Autometric, Latest
PRATT & WHITNEY 1A, Motor Drive

LATHES—Engine and Mtg.
AMERICAN 36"x260" centers, 2 carriages, motor drive
BRIDGEFORD 36"x32" bed—2 carriages, M.D.
HENDEY 12x30", Timken, Latest Type
JONES & LAMSON "Fay" 20x22", 24x24 autom., latest
LeBLOND 21"x96" centers, TIMKEN, Latest type
LeBLOND 16x30" centers, 14"x30" Timken, Latest
LEHMANN 16x30" centers, M.D.
LODGE & SHIPLEY 16"x30", 14"x30", M.D.
LODGE & SHIPLEY 18x72 centers, M.D.
LOSWING 4x60, 4x96, 8x60, 8x108, 8x24, Latest
MONARCH 10"x30" Centers, Model EE, Timken, latest
MONARCH 12"x30" Centers, Model CKK, Timken, lat.
MONARCH 12"x30" Centers, Model CK, Timken, latest
MONARCH 12"x30" Centers, Model CW, Latest
MONARCH 10"x72" Centers, 3 Carriages, Timken Bearing, Model CW, Motor Drive
MONARCH 22"x456" Centers, Model C, Motor Drive
MONARCH 24"x54" Ball Bearing, Geared Head, M.D.
NILES 20"x50" Boring "Time Saver" Timken, Latest
NILES 20"x50" Boring "Time Saver" Timken, Latest
PRATT & WHITNEY 16"x30" Centers, Timken, Latest
PRATT & WHITNEY 16"x30" centers, Bench, latest
PUTNAM 42"x22" Centers, Motor Drive
REED PRENTICE 20"x54" Centers, Model A, Latest
REED PRENTICE 20"x54" centers, Timken, latest type
SPRINGFIELD 16"x30" centers, Timken, latest
WARD, HAGGAS & SMITH—18/30x66" centers, gap motor drive, Latest Type

LATHES—Hob and Cutter Relieving
MICHIGAN 17s8 Universal, Latest Type
MICHIGAN 1712 Universal, Latest Type
U. S. TOOL #810B, Latest Type

LATHES—Turret
BARDONS & OLIVER #5, #7, TIMKEN, Latest Type
CINCINNATI ACME No. 1 Timken, Latest
CINCINNATI "Fastmatic," Timken, Latest
FOSTER #24U "Fastmatic," Timken, Latest
GISHOLT #1L, #2L, #3L Universal, Timken, Latest
GISHOLT #3, #4 univ., TIMKEN, Latest Type
GISHOLT #3, #4 univ., Timken, Latest
JONES & LAMSON 2" 1H5 Univ., Timken, Latest
LIBBY "International" 1H5 Univ., Timken Bearing, latest
MOREY No. 2G, No. 3, No. 4, Timken, Latest
MOREY No. 3 SLIDEMASTER, Timken, Latest
POTTER & JOHNSTON 5, Universal, Timken Bearing
WARNER & SWASEY #2, #3, Timken, Latest
WARNER & SWASEY #2, #3, Timken, M.D.
WARNER & SWASEY #2A, Univ., Timken, Latest type
WARNER & SWASEY 2A Universal, Timken, Bearing, Latest Type
WARNER & SWASEY 3A Universal, Timken Bearing, Latest Type
Jig, "Pre-selector" Bar and Chucking, Timken Bearing, Bar and Chucking, Latest Type

MILLING MACHINES—Mfg.
HALL Style L, Planetary, latest type
INGERSOLL 42"x36"x12" adj. rail, 4 heads, AC, M.D.
INGERSOLL 32x24x16" Planer Type, 2 heads, AC, M.D.
INGERSOLL 30x24" adj. rail slab, M.D.
INGERSOLL 20x20" adj. rail, 4th feed, Latest
SUNDSTRAND Model 3A Duplex Spline, latest
TAYLOR & FENN M80 Duplex Spline, latest

MILLING MACHINES—Plain
BROWN & SHARPE #2, Light Type, Timken, Latest
BROWN & SHARPE #12, 24" feed, Latest
BROWN & SHARPE #000, Timken, Latest Type
BROWN & SHARPE #2B, BB, Timken, Latest Type
BROWN & SHARPE #2B, Automatic, Latest Type
CINCINNATI 0-8, 1-12, 2-18, High Power, Latest Type
CINCINNATI #3, #4, #5 High Power, Latest Type
CINCINNATI 4-36 Hydromatic Simplex, Latest Type
CINCINNATI 4-36 Hydromatic #2H, 3H, 4H, 5H, Latest
KEARNEY & TRECKER #2H, 3H, 4H, 5H, Latest
KEARNEY & TRECKER 1218, 1404, Simplex, Latest
KEARNEY & TRECKER #3G, #4, Timken, Latest Type
KEMPSMITH #3G, #4, Timken Bearing, Late
KEARNEY & TRECKER 4K, Timken Bearing, Late

MILLING MACHINES—Thread
LEES BRADNER Model LT, 6"x26" Centers, Latest
LEES BRADNER Model HT, 12"x54" Centers, Latest
MOREY 12x30", 60", 120", 190" centers, Latest

MILLING MACHINES—Universal
BROWN & SHARPE No. 2A, Timken Bearing, Latest
BROWN & SHARPE No. 4A, Motor Drive
BROWN & SHARPE 2H, Timken, Latest Type
KEARNEY & TRECKER 2H, Timken, latest type
KEMPSMITH #4 Maxi-miller, Timken, latest type
KEMPSMITH #3 duplex, Motor Drive
VAN NORMAN #13, #26, #36, Timken, Latest Type

MILLING MACHINES—Vertical
BROWN & SHARPE #2 Standard Timken, Latest
CINCINNATI #2, #4 Dial Type, Timken, Latest
CINCINNATI #2, #4, TIMKEN, Latest Type
CINCINNATI #08, TIMKEN, Latest Type
GORTON 8D, 8½D, Super-Speed, Latest Type
KEARNEY & TRECKER 2H, 3H, Timken, Latest Type
MOREY 12M Single & Double Spindle Profiler, Latest
REED PRENTICE 3VG, with or without hydraulic duplicator, Timken bearing, Latest Type

PLANERS
BETTS (CONSOLIDATED) 84"x92"x16" 4 heads, Box Table, Rapid Traverse, D.C., M.D., Late Type
BETTS (CONSOLIDATED) 108"x84"x24" 4 heads, Box Table, Rapid Traverse, D.C., M.D., Late Type
CINCINNATI 30"x30"x8', 2 heads, PRT, DC, M.D.
CINCINNATI 30"x30"x8' 4 heads, Hydraulic, Rapid Traverse, A.C. Motor Drive
DETRICK & HARVEY 48"x48"x16' 4 heads, Box Table, Rapid Traverse, A.C. Motor Drive
NILES 108"x84"x42" 4 heads, Box Table, Rapid Traverse, D.C., M.D., Late Type
NILES 42"x42"x14" "Time Saver," Box Table, 3 Heads, PRT, VARI-VOLTAGE Drive, Latest
NILES 42"x42"x14", 4 Heads, PRT, Box Table, DC, Motor Drive
NILES 16"x16"x14', 4 Heads, PRT, Box Table, DC, Motor Drive

PRESSES
BIRDSBORO 225 ton, vert. hyd., Latest Type
BLISS 75-35 Hydro-Dynamic, Double Action, Latest
BLISS 75-35 Quenching, Hyd., Motor Drive
GLEASON 15" Quenching, Hyd., Motor Drive
HENRY & WRIGHT 50 ton Dieing, Roll Feeds, M.D.
LAKE ERIE 500 ton Vert., Hyd., Latest Type
NILES 400 ton, Horiz., Hyd., Motor Drive
UNITED ENG. 500 ton, Vert., Hyd., Latest

SCREW MACHINES—Automatic
ACME GRIDLEY 2" Model RAS, 6 spindle, Latest
CLEVELAND 9/16" to 1 1/16" Model A, Latest Type
CONOMATIC 1⅛"—2¼" 6 spindle, High Speed, Latest
CONOMATIC 1⅝"—2" 8 spindle, High Speed, Latest
CONOMATIC 2⅝"—6 spindle, Latest Type
GOSS & DeLEEUW 6"x18", 5 spindle Chucker, Tool rotating, Latest Type
GOSS & DeLEEUW 8" 5 spindle Chucker, Work Rotating, Latest Type

SHAPERS & SLOTTERS
AMERICAN 20" Heavy Duty, Motor Drive
DILL 20"-24" Vertical, Motor Drive
GOULD & EBERHARDT 20", 22", High Duty, M.D.
GOULD & EBERHARDT 20" Vertical, M.D.
PRATT & WHITNEY 20" Vertical, M.D.
SMITH & MILLS 16" high speed, latest type

SHEARS—Power
WYSONG & MILES #572, 14 gauge x 6', Latest Type
QUICKWORK #5, 1" Cap., Rotary Shear, M.D.
QUICKWORK #6, 1¼ Cap., Rotary Shear, M.D.

MISCELLANEOUS
AJAX 2", 2½" Forging and Upsetting, M.D.
BAKER #5 Keyseater Motor Drive
BARNES #172, 206H, 307, 307B Vertical Hone, Hyd., Self-Oiling, Latest Type
CAMPBELL #401 Abrasive Saw, Latest Type
DE LAVAL #194 Coolant Clarifier, Latest
LANDIS 2" Single & Double Spdle. Bolt Threader, M.D.
MANVILLE 2D 7/16" Cap. S8SD, Ball Header, M.D.
NAZEL #4B Pneumatic Hammer, M.D.
NORTON 32F 100 Vertical Lapper, Latest Type
PRATT & WHITNEY (KELLER) Type BL-2416, Type G Conving, 2 and 3 dimensional, Latest Type
PRATT & WHITNEY ½ to 50 Rifler, Latest Type
ROWBOTTOM Cam Miller, Motor Drive
VERSON #206 10 gauge x 96" Press Brake, Latest

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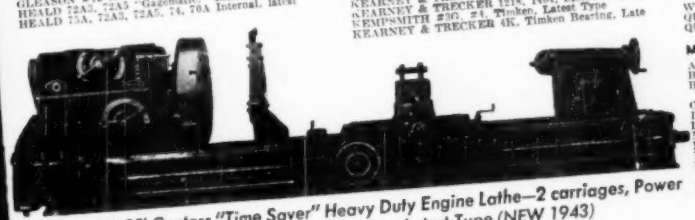

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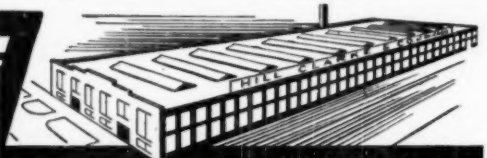

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AUTOMATICS
1⅝" Greenlee, 6 Spdls. (1941)
No. 81 New Britain 8 Spdls. 1⅝" (1942)
No. 6 Brown & Sharpe, M.D.
No. 49 New Britain, 4 Spdl. Chucker
Model A 1¼" Cleveland (1943)
Model A 3¼" Cleveland (1942)

DRILLS
No. 150 Baker Mfg. (1942)
No. 150 Baker, tapping (1942)
No. D8 Colburn, No. 6 Morse Taper
No. 4-BM Fosdick 4 Spdl. (1942)
No. 4-BM Fosdick 6 Spdl. (1942)
No. 1-LMS Leland-Gifford's (1942)
No. 2-LMS Leland-Gifford's (1942)
No. 4BL Natco 36 Spdl. (1943)
5' Western Heavy (1942)
6'-17" Fosdick Hyd. Economax Radial

GEAR MACHINES
No. 61-A Fellows Gear Shaper (1942)
No. 71-A Fellows Gear Shaper (1942)
No. 7125 Fellows (1943)
No. 72 Fellows Gear Shaper
No. 18H Gould & Eberhardt
72" Cincinnati Gear Cutter

BORING MACHINES
No. 350—T Giddings & Lewis 5" Bar
No. 31 Lucas 3" bar, M.D.
No. 46-B Heald Bore-Matic (1942)
No. 113—C Excello 2 Spdl. (1942)
36" Bullard Hi-Speed (1942)
42" Bullard (1944)
42" Colburn, M.D.
66" Colburn, M.D.

72" Niles Extra Heavy
84" Betts, M.D.

GRINDERS
3"x12" Brown & Sharpe No. 5 (1944)
4"x12" Landis, Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"-14"x36" Norton Type C Plain (1942)
10"x18" Norton Type C Plain (1943)
10"x48" Norton Type C Plain (1943)
10"x96" Landis type C hydraulic (1942)
Norton Motorized Grinders ranging from 6"x18" to 24"x240"
12"x48" Cincinnati Univ. (1946)
72A-3 Heald Internal Grinder (1942)
72A-5 Heald Internal Grinder (1942)
74 Heald Internal Gdr. (1942)
Bryant Internal Grinders (1942)
Model HRS Barber-Colman Hob & Reamer Sharpener (1942)

LATHES
14"x30" centers Pratt & Whitney, Model C
16"x54" centers LeBlond (1941)
16"x80" centers Pratt & Whitney, Model B
18"x6' American, Gdr. Head, M.D.
20"x8' American Geared Head M.D.
36"—48"x16' Lehman Hydratrol (1945)
36"x24' Lodge & Shipley Gdr. Head
8"x15" Sundstrand, Model D (1943)
10" Sundstrands (1942, 1943)
16" & 20" Fay Automatics (1942)
No. 2 Warner & Swasey, Bar Fd. (1942)
No. 4 Gisholt Univ. Turret Lathe, (1942)
No. 4R Libby, Bar Feed (1942)
No. H-5 Libby

No. 5 Bardons & Oliver (1942)
No. 5 Midland, Bar Feed (1942)
No. 1-H Libby, Extra Long Bed (1942)
18" Libby, 3½" Hole in Spindle

MILLING MACHINES
No. 2H Milwaukee Plain & Vertical (1942)
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
No. 3 Cincinnati H.P. Vertical
No. 1-18 Cincinnati Mfg. (1942)
No. 2—18" Cincinnati Rise & Fall (1941)
No. 2—18" Sundstrand-Electromil (1942)
No. 4-48 Cincinnati Hyd. Tracer (1942)
No. 34-48 Cincinnati Hyd. Duplex (1943)
No. 45-48 Cin. Hyd. Tracer (1941)
No. 56-72 Cincinnati Hydromatic
4½"x12" Pratt & Whit., Model C Thread Mill
6"x36" Lees-Bradner—Model HT (1943)
10"x48" Hanson-Whitney Thread (1942)
24"x24"x12' Ingersoll Adj. Rail Slab Miller
36"x36"x18' Ingersoll Slab Miller, 4 Hds.
No. 10 Ingersoll 72"x8' Travelling Col. Face Millers (1942)
No. 28-60 Cincinnati Hydrotel

MISCELLANEOUS
18" Dill Slotter
Micromatic Vertical & Horizontal Hydrohoners

PLANERS
36"x36"x12' Cincinnati
36"x36"x18' Gray Maxi Service, 4 Heads
48"x36"x14' Gray
48"x48"x12' Cincinnati, 4 Heads

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LATEST TYPES — GUARANTEED MACHINE TOOLS 1941-1946 MODELS

MILLING MACHINES
MILWAUKEE—2H Universal, H.S.
MILWAUKEE—2K Vertical, Sliding Head, H.S.
CINCINNATI—2M Vertical, Rotary Table
CINCINNATI—50 Vertical
CINCINNATI—4-36, 4-48, 45-48, 36-96 Plain Hydromatics
CINCINNATI—48-96 Hydromatic Rail Type, 2 Vert. Spdls., Tracer control
SUNDSTRAND—53—Rigidmil, 2 Vert. Heads
SUNDSTRAND—96—Rigidmil, Duplex—(arr. for milling the cam tracks in propeller hubs or similar work)
SUNDSTRAND—00—Rigidmil, Hydraulic
BROWN & SHARPE—No. 10 Plain, Production
BRIDGEPORT—Vertical, Turret, Hand Feed
MOREY—No. 12M 2-spindle Profiler
TAYLOR & FENN—M-80 Duplex Spline
RICE BARTON—Model K Duplex Spline
DECKEL Type—Die Sinker & Engraver (new)

THREAD MILLERS & TAPPERS
HANSON WHITNEY—8"x16" Thread Miller
MOREY—12"x60" Thread Miller
LEES-BRADNER—240A Thread Miller
HALL-PLANETARY—Type "B" & "C" Thread Millers
KAUFMAN—5A—Tapper, Lead Screw Type
MURCHEY—822—Tapper, Horizontal

GRINDERS—THREAD
EXCELLO—No. 31 & No. 33 External
JONES & LAMSON—TG-636 External
JONES & LAMSON—TG-1245 External
JONES & LAMSON—TG-125 Internal

GRINDERS—CYLINDRICAL
LANDIS—4"x12" Type "M" Hydraulic, Plain
LANDIS—6"x18" Type "C" Hydraulic, Plain
LANDIS—18"x18" Type "C" Hydraulic, Plain
LANDIS—18"x32" "Type D" Crankpin, Hydraulic
CINCINNATI—6"x18" Hydraulic, Filmatic
CINCINNATI—10"x72" Hydraulic, Filmatic
NORTON—12"x36" Model "C" Universal
BROWN & SHARPE—No. 5 & No. 10 Plain

GRINDERS—INTERNAL
HEALD—72A5 Plain, Fixed or Cross Feed Hd.
HEALD—72A3 Plain, Cross Feed Head
HEALD—72A3 Universal, T-Bed
HEALD—72A5 Sizematic
HEALD—72A3 Sizematic Centerless
HEALD—172 Gap Bed, Sizematic
BRYANT—112 Universal, Hydraulic
BRYANT—16-28 Hole Grinder
BRYANT—24-36 Heavy Duty
RIVETT—No. 104 Tool Room Grinder

GRINDERS—RADIUS
VAN NORMAN—No. 73 Oscillating Internal
VAN NORMAN—No. 639 Oscillating, Internal
VAN NORMAN—No. 639 Oscillating, External
VAN NORMAN—No. 3½ Radius, Universal

GRINDERS—SURFACE
THOMPSON—8"x12"x18" Type "B" Hydr.
THOMPSON—8"x12"x24" Type "B" Hydr.
THOMPSON—12"x10"x24" Type "BB" Hydr.
THOMPSON—12"x12"x40" Type "B" Hydr.
THOMPSON—12"x16"x48" Type "C" Hydr.
THOMPSON—12"x18"x96" Type "C" Hydr.
THOMPSON—24"x16"x60" Type "B" Hydr.
THOMPSON—30"x30"x120" Type "C" Hydr.
HEALD—No. 22 Rotary, 12" Magn. Chuck
ARTER—Model A-1, 8" Rotary
GARDNER—Model 120A Opposed Hd. Disc Grinder

HONING MACHINES
MICROMATIC—Model H-510 Hydrohoner, D.E.
MICROMATIC—Model H-2 Hydrohoner, S.E.

LAPPING MACHINES
NORTON—No. 26 Hyprolap
NORTON—Model 2F x 36" Hand Lapping
CINCINNATI—No. 2 Centerless
ULTRA-LAP—No. 10 Lapping

GEAR & SPLINE GRINDERS
PRATT & WHITNEY—10" Single Wheel
PRATT & WHITNEY—10" Double Wheel
PRATT & WHITNEY—18" Single Wheel
GEAR GRIND. MACH. CO.—GG-33 (16"x42") & GG-19 (10"x24"). Hydr. for Spur Gears and Splines
GLEASON—No. 17 for Spiral, Zerol and Hypoid Bevel Gears

GEAR CUTTING MACHINES
FELLOWS—No. 61 Gear Shaper
FELLOWS—No. 72 Gear Shaper
FELLOWS—No. 7 Gear Shaper
FELLOWS—Straight Line Generator
FELLOWS—Model 2 Horiz. Shaper
GLEASON—3" Bevel Gear Generator

GEAR FINISHERS & TESTERS
FELLOWS—8LSI & 13LSI Gear Lappers, External & Internal, Spur & Helical
GLEASON—Nos. 4 & 6 Bevel Gear Testers, hand & power operated
GLEASON—No. 13 Bevel Gear Tester, Univ'l.
ILLINOIS—No. 224 Involute Checker with or without recorder
MICHIGAN—No. 1124 Involute Checker with recorder
NATIONAL BROACH—Model SIC-12" Gear Tester

PRECISION BORING
HEALD—48A Borematic, S.E., 2-Sp. & 1-Sp.
HEALD—47A Borematic, S.E., 2-Spindle
HEALD—49 Borematic, D.E., 4-Spindle

LATHES — PRODUCTION
POTTER & JOHNSTON—5D Automatic
LODGE & SHIPLEY—1A Duomatic
LIPE-ROLLWAY—15"x30" Carbomatic
MICHIGAN TOOL—No. 170B Univ'l Relieving
LEBLOND—25"x48" Engine Lathe, raised to 40"

TURRET LATHES
GISHOLT—No. 3 Ram Type, Bar
GISHOLT—No. 5 Ram Type, Bar
JONES & LAMSON—No. 5 Ram Type, Bar
JONES & LAMSON—No. 7A Saddle Type, Chuck
WARNER & SWASEY—No. 3A Saddle Type, Bar
FOSTER—No. 2F Fastermatic
FOSTER—No. 4F Fastermatic

AUTOMATIC SCREW MACHINES
ACME-GRIDLEY—Mod. RA-6, 9/16" & 1", 6-Sp.
CONE—Conomatic, 1⅛", 8-spindle

DRILLING MACHINES
LELAND-GIFFORD—Mod. 2-LMS Deep Hole Vert'l.
BARNES-DRILL—No. 201½, 2-spindle, wide base
BAKER—No. 217, Upright, H.D.
BAKER—No. 30-NO 2-spindle, Inverted
FOSDICK—Model 48M, Upright, H.S.
PROVIDENCE ENG.—3/16" Sensitive, 6-spindle
P. & W.—½ Bx50 Deep Hole Reamer
SUNDSTRAND—No. 53, 4"x36" Centering

MISCELLANEOUS
CAMPBELL—No. 425 Cutulator
WILLIAMS—10" Pipe Cut Off Machine
RANSOME—No. 30 Welding Positioner
MARTIN—No. 12 Marking Machine
OLIVER—No. 2A Face Mill Grinder
OLIVER—10" Template Tool Bit Grinder
TANNEWITZ—Model GH-36 Band Saw
KENT—3½" Bar Pointer
OSBORN—No. 194 Core Blower
OSBORN—No. 602 Jolt Rollover
DENISON—918AM Test Stand

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CHECK THIS LIST OF FINE TOOLS

AUTOMATICS

¼", No. 0G Brown & Sharpe
9/16" Acme Gridley model R6
⅞" & 1¼" Cone 4 spindle
1⅛" Cleveland 4 spindle
1⅜" Greenlee 6 spindle
1⅝" New Britain 6 spindle
1⅞" Conomatic 8 spindle
2"x18" Cleveland model B
2⅝" Acme Gridley model RA6
8" Bullard Multaumatic
No. 2 FU Foster Fastermatic
No. 16 New Britain 6 spdl. chucker
14"x18" Fay chucker

BROACHES

No. 1 Foote Burt duplex surface
2 ton American horiz. hydraulic
No. 3 Oilgear horiz. hydraulic
No. 10-72 Colonial horiz. hydraulic
No. 3 Lapointe screw type
10"x72" Colonial broach sharpener

DRILLS, MULTIPLE

42 spdl. No. B 16 Natco
34 spdl. No. 30 Natco
24 spdl. No. B4A Natco
22 spdl. No. 14 Natco
16 spdl. No. 2 BL Natco
12 spdl. No. 39 Natco rail
12 spdl. No. 25 Baush rail
8 spdl. No. 11 Natco

GRINDERS

No. 72A3 Heald Sizematic internal
No. 72A3 Heald Sizematic centerless
Nos. 72A3, 72A5 & 74 Heald plain
No. 75A Heald hand feed
Nos. 18A16, 18-28, 16-30, 16CP16 & 24-36 Bryant
Model MHI Sav-way hydraulic
Size IC Grenby internal
No. 2 Cincinnati centerless
No. 10 Blanchard surface
Nos. 3 & 34 Abrasive surface
8"x24" Wilmarth Mormon surf.
12" & 16", No. 22 Heald rotary surf.
18" & 24" No. 25A Heald rotary surf.
No. 2 Norton universal tool
Model 4T Sellers tool
No. H6 Pratt & Whitney tool
No. 51 & 510 Oliver drill
No. 10G Sellers drill
Nos. 33 & 35 Excello thread

LATHES, TURRET

Model 6.2 Denver
Nos. 2 & 3 G Morey
No. 4 Midland
Nos. 5 & 7 Bardons & Oliver
No. 3 Jones & Lamson
No. 5 Foster
Nos. 2, 3, 4, 1A & 3A Warner Swasey
Nos. 3, 4, 5, 3AL & 28" Gisholt
24" & 36" Bullard vertical
No. 2 FU Foster Fastermatic
3"x36" & 4"x34" Jones & Lamson

MILLERS

No. 2H Kearney & Trecker univ.
No. 3 Cincinnati universal
Nos. 2AS & 3B Milwaukee plain
Nos. 2, 3 & 4 Cincinnati vertical
Nos. 2H & 3H Kearney Trecker vert.
No. 3V Van Norman vertical
No. 3 Kempsmith Maximill vert.
Nos. 1-12, 1-18, 2-18 & 2-24 Cint. auto
Nos. 0-8 & 2-18 Cint. Rise & Fall
Nos. 3-24, 34-36, 4-36, 4-48, 5-48, 56-72 and 56-90 Cincinnati Hydromatic
Nos. 1H-12", M18, M24 & 12-24 Kearney & Trecker
30", 42" & 84" Ingersoll Rotary
Nos. 4, 6, CT36 & 40 Lees Bradner thread
No. 12B Pratt & Whitney profilers

PRESSES

1000 ton Southwark hydraulic
1000 ton No. 666 Toledo coining
600 ton No. 2316½ Hamilton forging
350 ton No. F1350-42 clearing
48", No. 93½ Toledo double crank
Nos. P1, P2, P3, P4, P5, PG5 Ferracute
No. 6 American Can OBI

MILES MACHINERY CO.
SAGINAW, MICH.

A PARTIAL LIST OF LATE MODELS

AUTOMATICS

Brown & Sharpe #00G, N.B., #4, #6
Conomatic 6 sp. 1⅞" cap., CECO ⅝"
Fay 12"x80"
New Britain Gridley 6I—6 Sp. 2¼"

BORING MILLS

Giddings & Lewis #8, #25T, Bullard, 42" V.T.L.
Universal 3" horiz., Lucas #31 horiz.

DRILLS AND RADIALS

Canedy-Otto 3'-9" col.
Carlton 5'-10" col., Foote-Burt 6 Sp.
Cincl-Bickford Super-Service 21", 24"
Natco Model E-5 Multi-Spindle, 14 spindles
Sibley 24—29", Allen 6 Sp., Excelsior 21"

ENGRAVERS

Gorton #3U, 3Z, 3L; Deckel GI.
Gorton Cutter Grinders 375-2, 265-5

GEAR EQUIPMENT

Fellows #645Y, 72, 725 High Speed, Mikron Gear Rubber
Michigan, Gleason, Fellows Checkers
Gleason #2 Surface Hardener

GRINDERS—Miscellaneous

Brown & Sharpe #5 cyl., 3"x18", Black Diamond
Brown & Sharpe #1, #2, #3 Univ., #13 Univ. & Tool
Cincinnati #2 Centerless Filmatic
Cincinnati Universal Filmatic, 12"x36", 12"x48"
Covel #81A Utv. Tool & Cutter
Gardner #22A, 30" disc. Heald #1 Tool
Heald #72A3 Int. Sizematic
K. O. Lee Tool & Cutter
Landis #4H Cyl. 4"x12", #6 Thread, Landis Centerless
Norton #2 Tool & Cutter, Porter Cable Belt WG8
Oliver #510 Drill Pointer, Sellers #4G
Pratt & Whitney Radius #R6, Grenby Int.

GRINDERS—Surface

Abrasive #34 Vertical, #33
Atlantic 6x18" Power Feed, Foote-Burt Hammond
Blanchard #11—16" chuck, Brown & Sharpe #2
G. & L. #25, #35 Hyd., 6x18" & 8x24"
Hanchett #300, 12x48", Mattison 14x16x48 Hyd.
Norton 6x18" Hyd., Pratt & Whitney 12x40" Vert.
Reid #2A P.F., #2C Pose & Excello Spdl.
Thompson Hyd. 6x10x18", 6x12x18

LATHES

Bradford 14"x6', Hardinge Precision 9", cabinet
Hendey G. H. 16x30 with rollowing att.
LeBlond Regal 10"x31½", 15x30", 19x48", 21x60"
Lodge & Shipley 16x78" T.A., LeBlond HD 16x33"
Monarch 10"x20" EE, 16x78" T.A., 12x30" CKK
Monarch Model CKK 12x30" Dble. Compound
Rivett Precision, Logan 10"x30"
South Bend 9"x3', 9"x3½', 13x36", 10" Cabinet
Sebastian 12"x4', G.H., Sheldon 11x24, 1" collet

LATHES—Turret

Acme 4W, 6W, Bar and Chuck, 6W Fox Lathe
Bardons & Oliver #3, #5, Foster #3B
Brown & Sharpe #1, #2F Hand Screw Mach.
Gisholt #4, 5 Bar & Chuck—2L Saddle type
Hardinge ESM, 2nd operation
Jones & Lamson #8A Univ., Saddle, Threading
Oster #501 Rapiduction
Warner & Swasey #3, #4, #5, #4A—8" Bar Cap.

MILLS—Plain & Universal

Brown & Sharpe #2B Pl., #2A Univ.
Cincinnati #3 Plain, 2M H Univ.
Milwaukee #2HL, 2H, Plain, #2HL, 2H, Univ.
Van Norman #12, 20, 22L, 36 Kempsmith 2G

MILLS—Vertical—JIG BORERS

Brown & Sharpe #2, Index, Vernon, Bridgeport
Cincinnati #4, Jackson
Gorton #8D, 9J Plain, #8½D Duplicator
Kearney & Trecker #5H, 3H High Speed D.T.
P&W 1½B Jig Borer, Sip Jig Borer #MP-5
Moore Jig Grinder, Varnon jig borer
Morey #12M Profiler 2 sp.—Pratt & Whitney 12B

MILLS—Production

Brown & Sharpe #000, 12, 21
Cincinnati #1-12, 1-18, 2-18 Mfg.
Nichols Hand, U.S. MM 1, Kent Owens #1V
Sundstrand #08 Rigidmills, U. S. Duplex

PRESSES

Bliss #8 Dbl. Crank, Bed 42x90", 250 Ton
Bliss #675, 845B, 650 Hi-Production, 304A, 305A
Bliss 406 DBL Crank, D.A., Toggle, Bed 40x54
Bliss #28, 21 O.B.I., #4½ Double Action Cam
Bliss #58 OB, Gap Frame #62, 62A, 162
Ferracute Notching #C82
General Flexible Electric Screw Press
Henry & Wright 25, 75 Ton Dieing
Reliance #45 O.B.I.
V. & O. #102 Reducing
Zeh and Hanneman 30 tons

MISCELLANEOUS

BAND SAW: DoAll V16, Tannewitz #36M, 36" Marvel #8
BENDING ROLL: Buffalo #8, Excelsior #14
BROACH: 3L LaPointe Horiz. Hydr.
HACKSAW: Marvel #6A Automatic, #8, #4B
HONER: Micromatic #M-1 Hydrehoner, Sunnen
KEYSEATER: Mitts & Merrill, Baker, Davis, Burr
RIVET HAMMERS: Hi Speed, all sizes, Chic. Pneumatic
ROUTER: Onsrud #W240, #55 Oliver
SHAPER: 32" G. & E. Universal
TAPPERS: Bakewell #1, Haskins #2C, 3C
THREAD ROLLER: Waterbury-Farrel #30 with Dies
VERTICAL SHAPER: 6" Pratt & Whitney
WELDERS SPOT & SEAM: Taylor Winfield, Elsler 50 KVA, Thompson
WRAPPING ROLL: Buffalo #1½

HYDRAULIC EQUIPMENT

Cap.	Manufacturer	Platen	Stroke	Opening
500 Ton	Lake Erie	35x36"	30"	60"
600	Bald. S'thw'k	70x50"	22"	30"
500 D.A.	H.P.M.	36x36"	24"	36"
1000	French Oil	53x42"	20"	50"
350	Verson	40x40"	36"	72"
50	Dennison	22x20"	18"	23"
150	Southwark	34x30"	30 2" to 4"	

UP MOVING RAM PRESSES

3000 Ton Tryout and Hobbing
300 Ton Watson-Stillman Hobbing, NEW.
600 Ton Birdsboro 42x32 platen—20" stroke
900 Ton Birdsboro 40x32 platen—20" stroke
800 Ton Birdsboro 40x32 platen—20" stroke
600 Ton Southwark 34x23 platen—20" stroke
100-150 Ton Stokes self contained Molding
300 Ton Dunning and Boschart Molding Press
300 Ton Watson-Stillman 24x20 platen—8" stroke
500 Ton Self contained Shaft Straightenw.
300—500—600 Ton Wheil Presses

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MDNA MEMBER

LATE TYPE MACHINE TOOLS

AUTOMATICS
6" RPA-8 Acme-Gridley Chucker. 1941.
16" Bullard Mult-Au-Matic, 6 & 8 spdl. 1944.
1⅛" Greenlee, 6 spindle. 1942.
9/16" RA-6 Acme-Gridley. 1942.
No. 60 New Britain, 1" cap. 1943.

BORING MACHINES
No. 42 Lucas Horizontal. 1940.
No. 54 Excello Double End. 1940.
No. 46B Heald Single End. 1940.

DRILLS
3'9" "Mor-Speed". Latest.
25" Fosdick "Economax." 1941.
No. 217 Baker, box column. 1942.
No. 5 BM Fosdick, box column. 1942.

GEAR EQUIPMENT
3" Gleason Generator. 1941.
No. 6 & 17 Gleason Testers. 1943.
12" Red Ring Internal Shaver. Late.
No. GCL Red Ring Shaver. 1942.
No. 624A3 Fellows Side Trimmer. New.
No. 615A & 61A Fellows Shapers. 1943.
No. 7125A & 712 Fellows Shaper. 1943.
Vinco Spline & Gear Grinder. 1942.

GRINDERS, CYLINDRICAL
25" x 48" Landis, Crankshaft. Like New.
16" x 36" Cincinnati Plain. 1942.
12" x 48" Cincinnati Univ. 1943.
10" x 72" Landis Plain. 1942.
10" x 18" Norton Plain. 1942.

GRINDERS, INTERNAL
No. 74 Heald Ext. Bridge. 1941.
No. 72A3 & A5 Heald Plain. 1944.
No. 5 & 16A22 Bryant. Latest.

GRINDERS, SURFACE
No. 18 Blanchard, 36" Chuck. 1942.
12" x 16" x 60" Thompson Hyd. Latest.
No. 22 & 25A Heald Rotary. 1943.

LATHES, ENGINE
45" x 192" Axelson. 1942.
28" x 276" Bertram. 1942.
24" x 168" Sidney. 1942.
18" x 54" Lodge & Shipley. 1943.
19" x 48" Bradford. 1942.

LATHES, PRODUCTION
Gisholt "Simplimatic." 1940.
No. 3A LAS "Duomatic." 1943.
No. 2FU Foster "Fastermatic." 1943.
8" x 108" Lo-Swing Semi. Auto. 1942.
Model 8, 10 & 12 Sundstrand. 1942.
14" x 42" Monarch "Magna-Matic." 1941.
20" x 25" Fay Automatic. 1942.

LATHES, TURRET
36" Bullard Vertical. 1943.
No. 2A & 3A Warner & Swasey. 1943.
No. 1 & 8½" x 24" Acme Univ. 1943.
No. 2, 3 & 4 Warner & Swasey. 1943.
No. 2, 3, 5 & 7 Bardons & Oliver. 1942.

MILLS, PLAIN
No. 5 Cincinnati. 1943.
No. 4 Cincinnati Dial Type. 1942.
No. 4H & 4K Milwaukee. 1943.
No. 3 Van Norman. 1942.
No. 2HL Milwaukee. 1942.

MILLS, PRODUCTION
BL-2416 P&W "Keller," 1 sp. 1943.
BG-1 Keller, single spdl.
No. 1-14 & 2-20 Kent Owens. 1942.
No. 1224 Kearney & Trecker. 1942.
No. 3-56 Cincinnati Duplex, R & F. 1942.
No. 1-18, 2-18 & 2-24 Cincinnati. 1942.

MILLS, THREAD
6" x 60" Pratt & Whitney. Latest.
12" x 54" Lees Bradner. 1943.
4" x 9" Hanson Whitney. Late.

MILLS, UNIVERSAL
No. 2MH Cincinnati. 1942.
No. 2H Milwaukee. 1942.
No. 2SU & 26SU Van Norman. 1942.

MILLS, VERTICAL
No. 3B P&W Univ. Die Sinker. 1943.
No. 2K & 3H Milwaukee. 1942.
No. 2 & 3 Cincinnati. 1942.
No. 1 Cleveland. 1942.

PRESSES
No. 40-5½ Minstet. 1942.
100 Ton Hannifin, Hyd. Str. 1942.
50 Ton Denison. Hyd. Str. 1942.

INDIANAPOLIS MACHINERY & SUPPLY CO.
1961 S. Meridian St.
INDIANAPOLIS 6, IND.

No. 25T G. & L., 2½" table Hor. Mill, 1942
4" Univ. Table Mill, 60" vert. 96" hor., '43
36" & 42" King Side Hd. Vert. Mills, '43
Nos. 1A & 3 W. & S. Turrets, bar & chuck
Nos. 3 & 2MH Cincl. Pl. Dial Millers, late
Nos. 3K & 3H K. & T. Pl. Dial Millers, late
No. 36 Van Norman Pl. Miller, ram, '43
No. 2G Kempsmith Univ. Miller, 1943 (3)
No. 2416 Keller Duplicators, late
No. 9J Gorton Duplicator & Vert. Miller (2)
12"x24" G. & L. No. 45 Surface Grinder, '42
No. 70A Heald Internal Grinder, 1942
Gear Cutter, No. 13 B. & S., spur & bevel
No. 8 M. & M. Keysecter, AC, M.D.
30"x20" cen. Axelson Lathe, T. A.
30"x120" Hanchett Piano Surface Grinder

BENNETT MACHINERY CO.
30 Church St., New York 7, N. Y.

16"x54" Monarch 16-speed Timkenized Lathe
13"x30" Pratt & Whitney Model "B" Lathes
36"x25 ft. Niles-Bement-Pond Lathe
3" UNIVERSAL "Tri-Way" Horizontal Boring Mill
#33 Lucas Horizontal Boring Mill 4½"
10"x48" Norton "C" Plain Grinder
#3MS Cincinnati Dial Type Plain Miller

HAZARD BROWNELL MACHINE TOOLS, INC.
350 Waterman St., Providence, R. I.

HEAVY SQUARING SHEARS — FOR SALE

2 Birdsboro 156"x½" Power Gap Shears, 15" Gap, Back Geared, w/extra blades.
PRICE ..... $6,000.00 EA.

2 Hyde Park 156"x½" Power Gap Shears, 18" Back Geared, w/extra blades.
PRICE ..... $4,750.00 EA.

EXCELLENT CONDITION
IN STOCK FOR IMMEDIATE SHIPMENT

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WE HAVE THEM

BAUSH W-6 and W-7 Multiple Spindle Drills.
NATCO 2BL "Holesteel" Multiple Spindle Drills
50"x204" LeBLOND "Big Swing" Lathe
32"x36"x66" ROCKFORD Openside Shaper, Planer, 2 hds.
10"x72" NORTON Type "C" Plain Cylindrical Grinders.

Wigglesworth Machinery Co.
203 Bent Street, Cambridge, Mass.

Lindberg Model T-1218 Tubulaire Electric Pot Furnace.
Lindberg Model 3836-EH [illegible] Cyclone Furnace.
Leeds & Northrup No. 9562-U15-2 Electric Nitriding Furnace with controls.

D. E. DONY MACHINERY CO.
47 Laurelton Rd., Rochester 9, N. Y.

DEEP HOLE DRILL
Baush Horizontal Deep Hole Drill, rifle Barreling machine, with two motors, and two 3 jaw chucks, double end. *Late Type*
PRICE — $1,500.00

WINSTON MACHINERY CO., INC.
517 South Delaware St.
Indianapolis 4, Ind.

CRANE: Milwaukee 30 Ton 95' Span (New) with 15 ton Aux. Hoist.

PRESSES:
Z & H #7, 50 ton, Percussion
Bliss #6, 125 ton, Late
Clearing, 200 ton, Late
Bliss #310, 450 ton

TURRET LATHE—Gisholt #3L—Age 1943—Bargain.

ROLLS: BENDING
30"x¾" Pyramid
11'x¾" Initial
10'x¾" Roll leveller
BRAKES: PRESSES
Cincl. 14'x¼" (late)
Cincl. 10'x¾" (1935)
Obl 10'x⅜" (old)
PLATE EDGE PLANER:
N & J 32'x2"
PLANER
N B P 48"x48"x26', 4 heads
MILLER—PLAIN HORIZ.
K & T #4K (late)

KINGS COUNTY MACHINERY EXCHANGE
408 Atlantic Ave., Brooklyn 17, N. Y.
Dept. A Phone: TRiangle 5-5237

FOR SALE

110 Ton Cleveland Press Model 11S Air Cushion, W/M—New 1946 A-1 Cond.

SEABOARD STEEL CO., INC., New Haven, Conn.

UPSETTER

2"-Acme with V-Belt Drive 15 H.P. Motor

ALLIGATOR SHEAR

3" Round Capacity, 30" Blade No. 3
THOMAS CARLIN & SONS

GEAR CUTTER

84" Newton 1¼ D.P.

TOLEDO MACHINERY MART
6225 Benore Rd., Toledo, Ohio

BIG VALUES — SMALL TOOLS

1—Waterbury-Farrel, inclinable Power Press, 1½" stroke, 30 ton
1—Delta Cut-off Saw (New)
1—Seneca Falls Lathe, 12"x3', complete
2—Federal SOS Power Presses
1—Hanson-Whitney Slotter—motorized

STATE MACHINERY COMPANY
160-2 GOVERNOR STREET
PATERSON 1, N. J.
ARMORY 4-4959—4971

Metal Forming and Beading Machine
#206-F Toledo #55 Ton D.C. Press, 3" Stroke, 20" x 110" Bed Area
#6-D Potter & Johnson Turret Lathe
12 Spindle Moline Automatic Drilling Machine
3 Spindle Moline Model 7-D Cylinder Borer
1-A 'Y&S Universal Turret Lathe
16"x14' Schumacher & Boye Engine Lathe
Libby 26"x4½" Spindle Turret Lathe
26" Stockbridge Shaper
Lees-Bradner CT 36" Thread Millers
Crankshaft Grinder
Foote-Burt 4 Spindle Drill #2 M.T.
24"—H.S. Milling Cutters (New)

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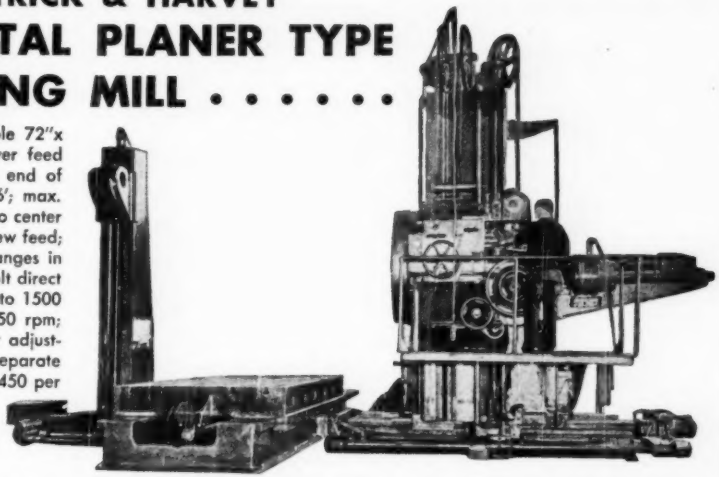
1836 EUCLID AVENUE, CLEVELAND 15, OHIO
MAIN 4402

EMERMAN offers from STOCK

7" DETRICK & HARVEY
HORIZONTAL PLANER TYPE BORING MILL . . . . . .



● Working surface of table 72"x 144"; Travel of table power feed 10'2"; max. distance from end of spindle to outer support 16'; max. distance from top of table to center of spindle 8'2"; Bar has screw feed; as 4 mechanical speed changes in gearbox and 35 HP, 220 volt direct variable speed motor, 500 to 1500 rpm; spindle speed 1 to 450 rpm; outer support has 5' power adjustment on outer way with separate motor; feed range .010 to .450 per rev of spindle; with power feed in all directions to table and head on upright.

(Table and Floor Type Boring Mills Ranging from 2½ inch to 7 inches—FOR SALE OR RENT)

EMERMAN MACHINERY CORP.

870 W. 120TH STREET — *CHICAGO 43, ILLINOIS*

LATE TYPE TOOLS

DRILLS

Cinn.-Bickford 5'15 Col. Super Service Radial Drill—Motor on Arm—Elec. Col & Arm Clamp—Power Traverse to Head

CANEDY-OTTO 21" Box Col. Upright, Coolant
LELAND-GIFFORD #1LMS 6-Spindle
LELAND-GIFFORD #2MS 2-Spindle, Hyd. Feed
LELAND-GIFFORD #2LMS Single Spindle, Mech. & Hyd. Feeds (3)

GRINDERS

Blanchard #11—16" Rotary Surface—New 1944—Rectifier—7 Wheel Mounts

CINCINNATI #2 Centerless, Filmatic, Thry & Infeeds
NORTON 6"x18" Type C Hyd., Plain (2)
NORTON 12"x36" Type C Hyd., Multi-Purpose, Universal
LANDIS #4H (4"x12") Hyd. Plain, Plunge Cut
LANDIS 10"x24" Type C Hyd., Universal
LANDIS 10"x48" Type C Hyd., Plain
NORTON 6"x10"x36" Openside Surface
HANCHETT Model 300 13"x48" Vertical Surface
ARTER A3—12" Rotary Surface, Pow. Elev. to Knee
SELLERS Model #6T Wet Tool

GEAR MACHINERY

Barber-Colman Type A Gear Hobber, N.D. 20" Extra Length of Bed

BARBER-COLMAN Type S Precision Gear Hobbers (3)
GOULD & EBERHARDT 12" Univ. Gear Hobber
HANSON-WHITNEY 4x9 & 8x16 Thread Millers
LEES-BRADNER #40 Chucking Thread Miller

LATHES

Monarch 10"x20" Model EE Precision Toolroom Lathe

BRIDGEFORD 36"x84cc Geared Head Engine
CARROLL-JAMIESON 15"x36"cc Geared Head Engine
MONARCH 14"x54"cc Model CAA Engine

TURRET LATHES

Warner & Swasey #3 Ram Type Universal, Bar Feed, 2-speed Motor, Considerable Tooling

BARDONS & OLIVER #2 Geared Elec. Head, 1" cap., Bar Feed, considerable tooling
GISHOLT #3R Saddle Type—Chuck & Bar Equipment
JONES & LAMSON #3 Ram Type Univ., Pres. Hd, 1500 RPM, Air Chuck
JONES & LAMSON #5 Ram Type, Pres. Hd, Chucker, Tremendous amt. tooling

MILLING MACHINES

K&T (Milwaukee) Model #4H Vertical Miller, Power Feed to Head, 4-position Turret Stop

K&T #3K Vertical, P.F. to Head
K&T #2K Vertical, P.F. to Head
K&T #2H Vertical, P.F. to Head
CINCINNATI #2 Dial Type, Hi Speed Vertical, P.F. to Head
CINCINNATI #3 Dial Type, Med. Speed Vertical
NICHOLS Hand Millers (2)
K&T #4H Plain, Duplicate Controls
B&S #2 Light Type Plain
B&S #2 Light Type Univ.
VAN NORMAN #2SP Plain
K&T #2B Plain, Timken, Motor in Base
INDEX Tool Room Mill, P.F. to Table
CINCINNATI #1-12 & #1-18 Production
CINCINNATI #2-18 Bed Type Production

MISCELLANEOUS

Cincinnati 10-gauge x 6' Model 1006R All Steel Shear, Hydraulic Hold-downs, Power Back Gauge, new 1945

BUFFALO #1/2 Univ. Ironworker (NEW)
CLEVELAND 3⅝ and 3¾ Single Spindle Automatic, lg. assortment tooling
FOSTER 4"x18" Cyl. Hyd. Superfinisher
FOOT-BURT #2—1½" Cap. Automatic Screw Machine

HASKINS #2C Tapper
HEALD #49 Single End Borematics (2)
LAPOINTE #3L Hor. Hyd. Broach
PRATT & WHITNEY #12B 2-spindle Profiler
REED Cylindrical Thread Roller, 1¼" Cap.
W.F.F. #10 Inclined Hopper Feed Thread Roller

UNITED offers from stock a very diversified and desirable line of late type machinery. Every machine checked and tested under power in our shop prior to shipment. Every machine guaranteed to perform as represented, with a 30-day trial plan offered. Many of the machines not listed. We invite your inquiries.

UNITED MACHINERY & TOOL CORPORATION

85 CENTRAL STREET — **WORCESTER, MASS.**

BOTWINIK

Bargains & Buys

GRINDERS

Brown & Sharpe #2, 14"x30", #4, 14"x60", Universal, tooling and attachments (very late).
Norton 10"x18" mech. and 10"x36" hydr. type "C" (late).
Cinn. #2 and #3 Centerless, film brg., long bar and auto. infeed attachment (late).

Farrel #30"x182" M.D. roll grinder, max. face ground 182" min. dia. ground 9".

DRILLS

Morris "Mor-Speed" 4' 9" column Hi-duty motor-on-arm—Radial—#4 taper (very late).
Cincinnati Bickford 4' 11" "Super-Service" motor-on-arm—Radial—#4 taper, (late).
Fosdick 5' 17" motor-on-arm "Economax" Hydr. —Radial—#6 taper (very late).
Moline #4, 3'-½" cap., M.D., 10 spdl. hole hog, wkg. tbl. 38"x8", #2 taper.

LATHES

American 16"x126" centers 12-spd. Hi-duty gr. hd., 18½" swing, motor-in-base, rpd. trav., Timken brg.
Monarch 20"x72" centers model "M", 16 spd. gr. hd. 22½" swing, Monarch auto. sizing control (late).
Lodge & Shipley 36"x16', 18 spd. sel. gr. hd. trpl. gr., 41" swing, 8'6" centers.

TURRET LATHES (late type)

Warner & Swasey #3, 1½" cap., #4, 2" cap. ram type Universal bar and chucking, tooling.
Jones & Lamson #5, 2½" cap. ram type Universal, rpd. trav. to cross slide, bar and chucking.
Gisholt #5, 2½" cap., ram type Universal, Preselec. hd., thread. attchmt., bar and chucking, tooling.

HOR. BORING MILLS

Universal 4" bar "Tri-Way", face plate to outer support 72", #6 taper, added vertical range (late).
Defiance 25A, 3¼" bar, face plate to outer support 72", #6 taper, added vert. and cross range (late).
Lucas #41, 3" bar, face to outer support 72", #5 taper (late).

MISC.

(New) Rafter All Steel Power Squaring Shears, available in two sizes, ½"x10' mild steel, ⅛"x10' stainless steel; 3/16"x 12' mild steel, 3/32"x12' stainless steel, stock delivery.

This Is Only a Partial Listing. Send for Our Catalog

Botwinik Brothers of Mass. Inc.
3 SHERMAN ST. WORCESTER 1, MASS.

PRACTICALLY NEW

Model #150 Defiance Hydraulic Horizontal Boring, Drilling and Milling Machine, Table Type.

5" diameter bar, quick change feeds and speeds, length of bed 10', working surface of table 48" x 84", Serial No. 1606-42, Mfg. in 1942.

PRICE **$17,500.00**

WILL TRADE FOR OLD STYLE CONE DRIVEN MACHINES.

ACTUAL PHOTO UPON REQUEST
IN STOCK FOR IMMEDIATE SHIPMENT.

WINSTON MACHINERY CO., INC.
517 S. Delaware St., Indianapolis 4, Ind.

LIKE NEW

24" Gleason Bevel Gear Generator
3A De Vlieg Jig Mill—3 in. Bar

Contact—A. B. Py

DAVIS & THOMPSON COMPANY
6411 W. Burnham St., Milwaukee 14, Wis.

FOR SALE

INDUSTRIAL CHILLING MACHINE

DEEPFREEZE CASCADE 120° F. Height 88" Length 82", Width 32½", Approximately 7½ cubic feet. WITH 2 MOTORS, ⅓ and ¾ HP. 6/60/220.
PRICE $850.00

WINSTON MACHINERY CO., INC.
517 South Delaware St., Indianapolis 4, Ind.

MACHINERY FOR SALE

ATTENTION EXPORTERS!

Unusual opportunity to procure modern Fellows Gear Shapers 615A and 615 as well as 12" Gleason Generators, 36 BM Gould & Eberhardt Rougher, #7 Fellows Gear Shaper, #16 D. E. Whiton Machine. Write for full information.

FS-1633, AMERICAN MACHINIST
330 W. 42 St., N. Y. 18, N. Y.

PLANER FOR SALE

DETRICK & HARVEY 60" x 60" x 18' openside planer, with two rail heads and one side head. Serial No. 827.
Price $4,000.00

Excellent Condition

WINSTON MACHINERY CO., INC.
517 So. Delaware St., Indianapolis 4, Ind.

FOR SALE

KINGSBURY 8 SPINDLE DRILLING AND TAPPING MACHINE. New Condition. Price about 1/3 new cost.
1—2⅝" 6 ACME GRIDLEY #84326 about $8,000.00 extra tooling.

ROBERTS SCREW PRODUCTS
6525 Penn Avenue S., Minneapolis 9, Minn.

FOR SALE

Warner & Swasey #6 Hand Screw Machine. Turret 2½" capacity. Drive All Transmission & Motor $250.00.
Candy-Otto 6 Spindle Drill Press Ser. 1731 10 year old $2100.00.
#4 Morse Taper, Individual Motor Drive, and power feed.

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242 Mulberry Street, Wyandotte, Mich.

POWER PRESSES

BLISS, TOLEDO, V & O, ETC.
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JOSEPH **HYMAN** & SONS
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330 W. 42nd St., New York 18, N. Y.

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VERTICAL MILLING MACHINES

No. 28-120 Cincinnati Vertical Hydrotel, 1942 machine
No. 5B Cincinnati, m.d., latest
No. 2M Cincinnati, m.d.
No. 3, 4 Cincinnati H.P., m.d.
No. 2, 3, 4 Cincinnati High Speed Dial, m.d., latest
No. 2, 3 Cincinnati Medium Speed Dial, m.d., latest
No. 2H, 4H Milwaukee, m.d., latest
No. 2HL Milwaukee Swiveling Head, m.d., latest
No. 2K, 3K, 4K Milwaukee Dial, m.d., latest
No. 2½B, 3B, 4 Milwaukee, m.d.
No. 3V Toledo, s.p.d.
No. 3V Van Norman, m.d., latest
No. 5 Brown & Sharpe, cone
No. 5 Jackson, m.d.
No. 5 Reed-Prentice, m.d., latest
No. 6 Becker, cone
Cincinnati Hydromatic, m.d., 2 spindles

PLANERS

P10 Coulter Crank Type Shaper-Planer, 1 head, m.d.
20"x20"x 5' Whitcomb-Blaisdell Planer, belted m.d., 1 head
24"x24"x 6' Cincinnati, m.d., 2 heads
30"x30"x10' Cincinnati, belted m.d., 2 heads
30"x30"x10' Gray, 2 heads, belt
30"x30"x14' Gray 2 heads, belt
32"x32"x16' Gray, 2 heads, belt
36"x36"10' Cincinnati, belted m.d., 2 heads
36"x36"x10' Niles, 2 heads, belt
36"x36"x18' Niles-Bement-Pond, 2 heads, reversing m.d.
36"x36"x20' Cincinnati, 2 heads, belt
36"x36"x20' Gray, 2 heads, belt
36"x36"x24' Cincinnati, belted m.d., 2 heads
38"x38"x20' Gray Spiral Drive, 2 heads, belt
42"x42"x26' Gray, 2 heads, belted m.d.
48"x48"x18' Detrick & Harvey, 4 heads, reversing m.d.
48"x48"x28' Cincinnati, 4 heads, reversing m.d.
48"x48"x30' Cincinnati, 4 heads, m.d.
48"x48"x32' Niles-Bement-Pond, 4 heads, reversing, m.d.
48"x48"x40' Sellers, 2 heads, reversing m.d.
52"x52"x40' Cincinnati, 4 heads, reversing m.d
66"x60"x40' Niles-Bement-Pond, 4 heads, reversing m.d.
72"x72"x36' Niles, 4 heads, reversing m.d.
96"x72"x18' Pond, 4 heads, belted m.d.

SAWS

6x6" Peerless Hack Saw, m.d.
6x6" Peerless Hydraulic, m.d.
6x6" Peerless Universal, m.d.
7½ H.P. Cincinnati Elec. Tool Co. Abrasive Cut-off Machine type JCAW
DeWalt Model ME 1 Abrasive Cut-off Machine, m.d.
No. 3 and 8 Nuttor & Barnes Cold Saws
No. 6 Cochran Bly Cold Saw
No. 138 Espen Lucas Cold Saw, m.d.
Gustav Wagner Cold Saw, m.d.

THREAD MILLING MACHINES

No. CT-38 Lees-Bradner, m.d., latest
No. CT-54 Lees-Bradner, m.d., latest
Hall Planetary, m.d.
4½x12", 6x14", 6x48", 6x29", 6x36" Pratt & Whitney
10x24" Hanson Whitney, m.d., latest
10x48" Hanson Whitney, m.d.

PLAIN MILLING MACHINES

No. 000 Brown & Sharpe, m.d., latest
No. 1A Milwaukee, m.d.
No. 1M Cincinnati, m.d.
No. 1 Special Plain Kearney & Tracker Milwaukee, m.d.
No. 1½, 2, 3 Cincinnati, cone
No. 2B Brown & Sharpe, m.d., latest
No. 2 Cincinnati H.S. Dial, m.d., latest
No. 2 Rockford, m.d.
No. 2HL Milwaukee, m.d., latest
No. 2MH Cincinnati, m.d., latest
No. 3 Cincinnati H.S. Dial, m.d., latest
No. 3 Standard Cincinnati, m.d.
No. 3B Brown & Sharpe, m.d., late
No. 3, 4 Kempsmith Maxi-Miller, m.d.
No. 3B Milwaukee, m.d.
No. 3 Van Norman Duplex, s.p.d.
No. 4 Cincinnati H.P., m.d.
No. 4 Ohio, cone
No. 5 Cincinnati, rect. overarm, m.d.
No. 5 H.D. LeBlond, s.p.d.
No. 5B Brown & Sharpe Heavy, m.d.

UNIVERSAL MILLING MACHINES

No. 1B Milwaukee, m.d.
No. 2A Brown & Sharpe, s.p.d.
No. 2 Cincinnati Medium Speed Dial, m.d., latest
No. 2 Cincinnati, cone, motorized
No. 2M Cincinnati, m.d.
No. 2 Kempsmith, cone
No. 3 Kempsmith, cone
No. 3A Brown & Sharpe, s.p.d.
No. 4A Brown & Sharpe, m.d.
No. 4 Cincinnati H.P., m.d.
No. 4G LeBlond, s.p.d.

PRESSES

No. 3 Bliss Stiles Type Press, belted m.d.
Ferracute Double Crank, 36" between uprights, 84 ton cap.
96"—400 ton Niles Driving Wheel Press, m.d.
Chambersburg 30 ton Hydro-Pneumatic
Metalwood B 45

SHEET METAL MACHINERY

No. 411D Toledo Power Squaring Shear, m.d.
No. 3 Hilles & Jones Pinte Bending Rolls, m.d.
No. 1 Savage Nibbler, m.d., 34" throat
Gray Turret Head Metal Cutter, cap. ¼", 36" throat
No. 2 Libert Nibbler, 28" throat
Southwark Rotary Metal Cutter, 36" throat, m.d.
120" No. 100 Niagara Heavy Production Folder, 16 ga., m.d.

SLOTTERS

10" Newton, cone
12" Bement-Miles, m.d.
15" Canada, m.d.
20-24" Dill, m.d.
48" Niles-Bement-Pond Geared, m.d.

SHAPERS

18" Invicta Shaper, m.d. thru gear box, new
24" Invicta Shaper, m.d. thru gear box, new
24" Potter & Johnston, cone
32" Morton Draw-Cut, m.d., late
32" Smith & Mills, m.d. thru gear box, latest
36" Morton Draw-Cut, m.d., late
48" stoke Heavy Duty Morton Traveling Head Draw-Cut Shaper, m.d., with d.c. variable voltage equipment, 12' bed, latest type

MISCELLANEOUS

No. 2A Pratt & Whitney Jig Borer, m.d.
Gisholt Precision Balancing Machine, m.d.
96" Ohio Extra Heavy Worm Feed Revolving Table, m.d.

We carry an average stock of 2,000 machines in our 11 acre plant at Cincinnati. Let us quote on your requirements.

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio — MElrose 1241 — CABLE ADDRESS EMCO

LATE TYPE MACHINES FOR SALE

B & S #2G High Speed Automatic, 1½" Cap.
American Hole Wizard Radial 6' x 15"
Rowbottom Cam Miller
Sip Swiss #5B & Pratt & Whitney #2 Jig Borers
B & S #1 Universal Grinder
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INDEX OF PRODUCTS ADVERTISED IN THIS ISSUE

Abrasives, Coated 18-19

Accessories & Attachments (Machine Tool) 38, 54

Bearings ..... 4th Cover

Books, Technical 154, 157, 162

Boring, Drilling & Milling Machines (Horizontal) 14, 24-25, 45, 118

Boring Machines Internal ..... 2nd Cover

Boring & Turning Machines (Vertical) 15, 114

Broaching Machines 129

Centrifugal Machines 155

Controls, Electrical 28-29

Counters 17

Coolant Systems, Filters & Supplies 150, 152

Cut-Off Machines; Sawing Machines 155, 161

Dressers, Grinding Wheel 111

Drilling Machines 30, 40, 47, 52, 114, 127, 139, 154, 158

Fasteners 26, 131, 137

Forgings 158

Gages & Instruments 36, 137, 149, 151, 158, 162

Gear Cutting Machines 3, 6-7, 140, 144, 148, 159

Gears, Speed Reducers, Motor Reducers 143, 157, 158, 160, 161

Gear Testers 3, 6-7

Grinders—Cutter & Tool 146, 159, 160

Grinding Machines—Production ..... 2nd Cover, 4-5, 12-13, 46, 155, 160

Heat Treating Equipment & Supplies .. 161

Jig Borers 158

Lathes, Automatic 16, 35, 44

Lathes, Engine 20-21, 35, 37, 41, 125

Lathes, Turret 35

Lubricants, Cutting Fluids, Quenching Oils & Solvents 33, 34, 116, 159

Materials, Cutting & Forming 111, 164

Materials of Manufacture 31, 135, 158

Materials Handling Equipment 145

Mechanical Parts & Equipment 159

Millers, Die Sinkers, Profilers 4-5, 8-9, 24-25, 112, 159

Oil Purifiers 153

Power Transmission 28-29, 48

Presses, Forging & Forming Equipment & Supplies 133, 141, 158, 159, 161

Production, Inventory & Tool Control . 142

Riveting Machines 161

Screw Machines; Chucking Machines 3rd Cover, 22-23, 35, 39, 43, 158

Shapers, Slotters, Keyseaters 54, 158

Stampings 161

Tapping Machines 52, 139

Thread Cutting Machines .. 10-11, 22-23, 42, 159

Tools, Cutting 32, 38, 114, 146, 158, 161

Tools, Portable 147

Welding & Cutting, Brazing & Soldering Equipment & Supplies 27, 137

Wheels, Abrasive 18-19

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HEADQUARTERS FOR INDUSTRIAL INFORMATION

ADVERTISERS INDEX

	Page
Abrasive Machine Tool Co.	155
American Brass Co.	158
American Magnesium Corp.	31
American Screw Co.	131
American Steel Foundries, King Machine Tool Div	41
American Tool Works	20-21
Armstrong-Blum Mfg. Co.	155
Armstrong Bros. Tool Co.	38
Barber-Colman Co.	32
Bardons & Oliver Inc.	42
Barrett Co., Leon J.	155
Baumbach Mfg. Co., E. A.	161
Bilgram Gear & Machine Co.	158
Blanchard Machine Co.	46
Brown & Sharpe Mfg. Co.	22-23
Bryant Machy. & Engrg. Co.	40
Bullard Co.	43
Carlton Machine Tool Co.	156
Carpenter Steel Co.	164
Cincinnati-Bickford Tool Co.	47
Cincinnati Gear Co.	160
Cincinnati Grinders Incorporated	5
Cincinnati Milling Machine Co.	4
Cincinnati Planer Co.	15
Cincinnati Shaper Co.	54
Cleereman Machine Tool Co.	40
Cleveland Punch & Shear Works Co.	141
Colonial Broach Co.	129
Columbus Die Tool & Machine Co.	159
Cone Automatic Machine Co.	39
Covel Manufacturing Co.	146
Cross Co.	144
Davis Keyseater Co.	158
Davis & Thompson Co.	154
Dayton Rogers Mfg. Co.	161
Dearborn Gage Co.	137
DeLaval Separator Co.	153
Dempster Brothers Inc.	145
Eastern Machine Screw Corp.	161
Ex-Cell-O Corporation	114
Federal Products Corp.	151
Fellows Gear Shaper Co.	6-7
Fosdick Machine Tool Co.	30
Gallmeyer & Livingston Co.	160
Ganschow Gear Co.	160
General Electric Apparatus Dept.	28-29
Giddings & Lewis Machine Tool Co.	14
Gisholt Machine Co.	44
Gleason Works	3
Globe Gear Co.	158
Goss & de Leeuw Machine Co.	156
Grant Gear Works	161
Grant Mfg. & Machine Co.	161
Gray Co., G. A.	45
Grob Brothers	161
Hamilton Tool Co.	140
Hartford Special Machinery Co.	139
Haskins Co., R. G.	147
Heald Machine Co.	2nd Cover
Hones, Inc., Charles A.	161
Kearney & Trecker Corp.	24-25
Kent-Owens Machine Co.	112
King Machine Tool Div. American Steel Foundries	41
Landis Machine Co.	10-11
Landis Tool Co.	12-13
LeBlond Machine Tool Co., R. K.	37
Lees-Bradner Co.	148
Leland-Gifford Co.	127
Linley Brothers Co.	158
Lucas Machine Division, New Britain Machine Co.	118
Luers, J. Milton	158
McCaskey Register Co.	142
McGraw-Hill Book Co., Inc.	154, 157, 162
Meisel Press Mfg. Co.	160
Midland Steel Products Co.	137
Monarch Machine Tool Co.	125
Morris Machine Tool Co.	52
Mueller Brass Co.	135
Newark Gear Cutting Machine Co.	159
New Britian Gridley Machine Co.	3rd Cover
Norton Co.	18-19
Oliver Instrument Co.	159
Perkins Machine & Gear Co.	157
Philadelphia Gear Works	143
Potter & Johnston Co. Sub. Pratt & Whitney Div., Niles-Bement-Pond Co.	16
Reeves Pulley Co.	48
Reid Bros. Co. Inc.	160
Ruthman Machinery Co.	150
Sciaky Bros., Inc.	27
Sheffield Corp.	111
Sheldon Machine Co.	159
Shore Instrument & Mfg. Co. Inc.	156
Standard Oil Co. (Indiana)	33, 34
Standard Pressed Steel Co.	26
Stuart Oil Co., D. A.	159
Sun Oil Co.	116
Taft-Peirce Mfg. Co.	149
Threadwell Tap & Die Corp.	146
Timken Roller Bearing Co.	4th Cover
U. S. Hoffman Machinery Corp.	152
V & O Press Co.	159
Van Keuren Co.	36
Van Norman Co.	8-9
Veeder-Root Inc.	17
Waltham Machine Works	159
Warner & Swasey Co.	35
Webber Gage Co.	162
Willeys Carbide Tool Co.	161
Wilson Co., K. R.	133
Zeh & Hahnemann Co.	156

SEARCHLIGHT SECTION
(Classified Advertising)

EMPLOYMENT
- Positions Vacant 165
- Selling Opportunities Offered 165
- Positions Wanted 165
- Selling Opportunities Wanted 165
- Employment Services 165

SPECIAL SERVICES
- Contract Work 165
- Francis Metal Products Corp. 165
- General Pattern Works 165

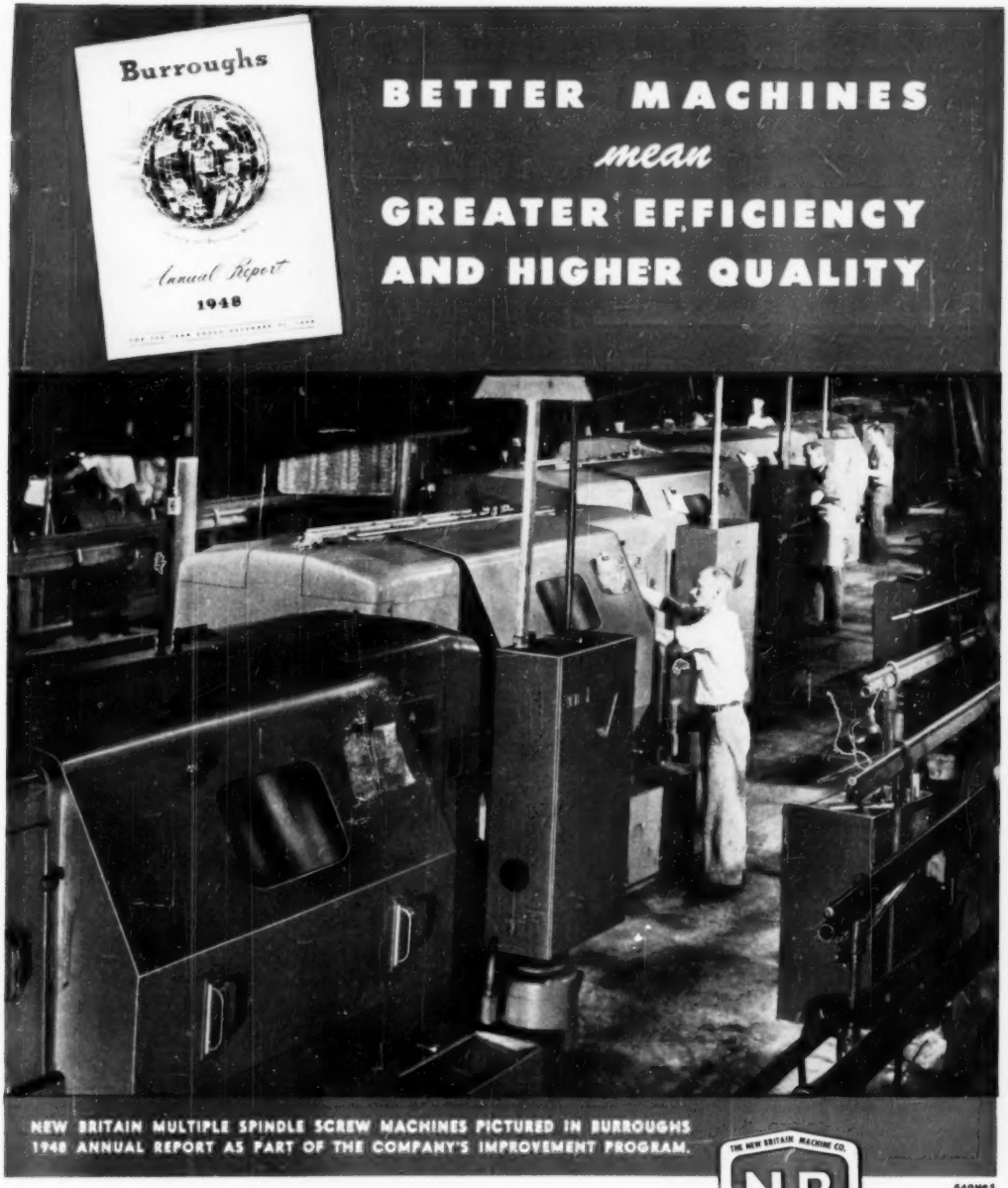
NOTICES
- Auction 166

EQUIPMENT
- (Used or Surplus New)
- For Sale 166-175

WANTED
- Equipment 165

ADVERTISERS INDEX

Aaron Machinery Co.	171
Bennett Machinery Co.	172
Botwink Bros. of Mass., Inc.	174
Brownell, Hazard Machine Tools, Inc.	172
Capitol Machinery Corp.	175
Continental Salvage & Machinery Corp.	172
Davis & Thompson Co.	174
Dony Machinery Co., D. E.	172
Eastern Machinery Corp.	175
Emerman Machinery Co.	173
Falk Machinery Co.	167
Hagrett's Small Parts Machining	174
Hill-Clarke Machinery Co.	170
Hyman & Son, Joseph	174
Indianapolis Machy. & Supply Co.	172
Kings County Machy. Exchange	172
Loetzer, Mrs. C. L.	165
Miles Machinery Co.	171
Morey Machinery Co.	169
Mutual Positions Plan Associates	165
National Machinery Exchange	175
Niagara Machine & Tool Works	165
Noll Equipment Co.	168
O'Connell Machinery Co.	174
Osborne & Sexton Machinery Co.	175
Paul's Machinery Co.	175
Roberts Screw Products	174
Rosen & Co.	166
Seaboard Steel Co., Inc.	172
Simmons Machine Tool Co.	168
State Machinery & Metal Co.	172
Toledo Machinery Mart	172
Triplex Machine Tool Corp.	170
United Machinery & Tool Corp.	173
West Penn. Machinery Co., Inc.	175
Wigglesworth Machinery Co.	172
Winston Machinery Co., Inc.	172, 174, 175



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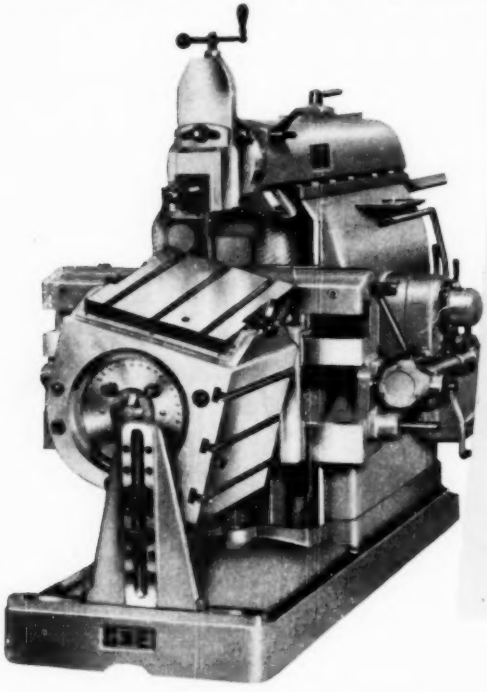
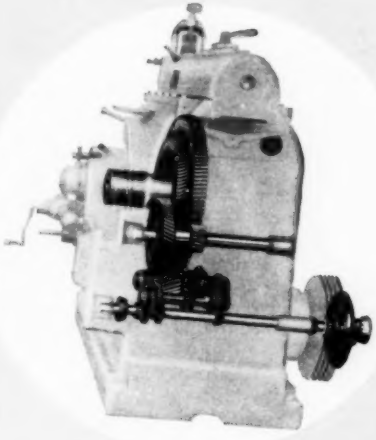
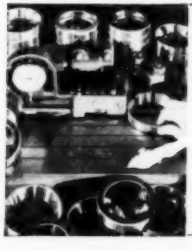




Phantom view of G & E 16-speed shaper transmission, showing pulley shaft and transmission gear shafts mounted on Timken bearings.



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